ERRATA.

Page 75, line 14 from bottom, *for* "excess," *read* "total."
,, ,, ,, 8 ,, ,, *for* "5·22," *read* "6·88."
,, ,, ,, 7 ,, ,, *for* "9·75," *read* "14·40."
,, 97, ,, 2 ,, ,, *for* "$\frac{1}{18}$," *read* "·18," and *for* "$\frac{1}{29}$," *read* "·29."
,, 104, ,, 18 ,, ,, in third column, *for* "5·0," *read* "—5·0."

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SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE.

VOLUME THE FIRST.

1866.

LONDON:
EDWARD STANFORD, CHARING CROSS, S.W.,
AND ALL BOOKSELLERS.

OID

INDEX.

A new enemy to rain gauges 66
Aneroid, Derivation of 105
Arrival of Birds 34
Aurora Borealis 11

Barometer, low 8, 16, 33
,, formula wanted 41
,, simple formulæ ... 52, 60
Birds, Arrival of..... 34
Black Rain 35
Board of Trade 67
Budleigh, Earthquake at 82

Canada, Harvest in 78
Cardington, Droughts at 42
Country Villages, Water for..... 1, 9
Cold Winters 101

Depth of Wells..... 20, 27
Discoloration of Paint 65
Droughts at Cardington 42

Earthquakes 82
Explanation of Tables 3
Equivalents of Wind Force 19, 34

Fall of Rain in September 75
Fixing Rain Gauges 25
Flood in Mauritius..... 10
,, in Yorkshire 70, 86
France, Rainfall in..... 83

Gales..... 8, 16, 33
Grass, Min. Ther. 8, 57, 61

Hail on March 8th..... 17
Harvest in Canada 78
History of a Thunderbolt 66

Incomplete Rain Experiments 96
Introductory 1

January, 1866..... 3
June 27th, Storms of 43, 59

Latitude of Stations 25

Mauritius, Floods in 10
Meteorological Department 67
,, Notes on each Month, 5, 13 23, 31, 39, 55, 63, 73, 80, 88, 99, 107
Meteors 18, 82
,, Shower of Nov. 14th 90, 91, 109
Migration of Swallows 97
Minimum Ther. on Grass .. 8, 57, 61

Notabilia of January, 1866 3
Notes on Weather in each month, 5, 13, 23, 31, 39, 55, 63, 73, 80, 88, 99, 107

Paint Discoloration 65
Periodic Hail Shower(?).. 17
Periods of Drought..... 42
Port Louis, Floods at..... 10

Radiation Thermometers..... 8, 57, 61
Rain, Black..... 35
Rainfall in each month ...4, 12, 22, 30, 38, 54, 62, 72, 79, 87, 98, 106
,, in France 83
,, January to June, 1866..... 58
,, in September (special)..... 75
,, in Yorkshire 86
Rain Gauges, Enemy to..... 25
,, ,, Fixing 66
,, ,, Experiments 96, 105
Recent Publications 26, 110

September Rainfall 77
Simple Barometric formulæ.....52, 60
Storage of Water..... 9
Storms of June 27th 43, 59
Swallows, Migration of 97

Temperature of Wells..... 20
Thunderbolt, History of 66
Thunderstorms 8, 15, 42, 43, 59

Water for Villages 1, 9
Wells, Temperature and Depth..20, 27
Wind Force Equivalents..... 19, 34
Winters, Cold 101

Yorkshire Floods 70
,, Rainfall..... 86

SYMONS'S
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METEOROLOGICAL MAGAZINE.

I.] FEBRUARY, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

INTRODUCTORY.

I BELIEVE that it is a rule *not* to judge of a serial by its first number, and I hope that the rule will be adhered to in the present instance, since future numbers will, at any rate, receive more time and attention than the present one, which having to appear simultaneously with *British Rainfall*, 1865, has had to be cared for in scraps of time snatched from its more bulky *confrère*. But let not this semi-apology be construed as a promise of future brilliancy, on the contrary, I would now, as ever, rather promise nothing, and let all I do sink or swim by its own merits; still it may be well to state that I *hope* to give in future numbers, Tables of Foreign and Colonial Rainfall, Notes on Thunderstorms in England during 1856-7 and 8, also on those in 1864 (these are somewhat voluminous, and contain not only curious results as to colour, &c., of lightning, but also as to its mechanical effects); Notices of Meteorological Books, new and old; and, above all, the latest rainfall intelligence, both as to its fall, its measurement, its publications, and its instruments. Lastly, I need hardly say, that its future depends very much on its readers; if they will send me prompt and full information of any unusual occurrence in their neighbourhood, and if they will (if they think it good) recommend it to their friends, the two essentials of high quality and a paying circulation may be obtained; and so I may be able to enlarge it, though my maxim always is, say everything in as few words as possible.

G. J. SYMONS.

136, Camden Road, N.W., Feb. 7th, 1866.

ON THE STORAGE OF WATER FOR COUNTRY VILLAGES.

THE severity of the drought during the last two or three summers has helped to force public attention to a point not generally appreciated at its full import. I refer to the influence of drainage operations on the supply of water available for man and beast in the summer months and periods of drought. It is very desirable the

present copious water supply should not obliterate the remembrance of recent want, and I therefore take this early opportunity of quoting Mr. Bailey Denton's last communication to the *Times*, and expressing a most earnest hope that something may be done.

To the Editor of the Times.

SIR,—The excessive rainfall of the present winter, following as it does three successive summers in which drought has been experienced, must, I believe, have satisfied all persons of the propriety of storing the excess of certain periods to supply the deficiency of others, and it cannot fail also to bring those who have watched the progress of drainage throughout the country to the conclusion that the collection of water discharged by drainage ought to be a part of the same operation with drainage itself, although with the valleys covered with water as they now are it may be hard to recall the fact that there were many rural places in which the poor cottagers were paying as much as 1d. a pail for water during the past summer.

In the first month of winter (October) we had a rainfall equal to half the fall of the previous six summer months, although in July and August there were extraordinary storms in which very heavy rainfalls occurred. From October up to the present time the rainfall has been above the average, the consequence of which will be that, as the subterranean supply will be fully replenished, and the crust of the earth more than satisfied, those lands that have been underdrained will continue to discharge water until we are well advanced into summer. We shall thereby have the means of storing water of the best quality after the present floods have passed away, thus showing that had storage reservoirs been at hand we should have been able to select either the inferior surface waters, which are now in excess, or the superior waters discharged from the under drains when the excess has passed away, and so provide for any coming drought.

For small towns and villages this mode of collecting a supply might be most economically carried out. Reservoirs sufficient to hold enough water for an ordinary village of 400 persons may be made, and the water conveyed down the village street, with proper stand-pipes, for about 1*l.* a head. In some instances several villages might combine for larger reservoirs, which in some cases might cost more, but in others, where circumstances favoured a combination, even less than the sum named.

I have the honour to be, Sir, your obedient servant,

J. BAILEY DENTON.

Seeing that even the £400 for which (if I understand rightly) Mr. Denton undertakes to construct his reservoir, lay down mains, &c., &c., is not easily available in every village, and recognizing fully the imperative necessity of some decided steps being taken to store our spare water for future use, I would suggest that labour and spades would alone be required for the following, which would store a great deal of water, good enough at any rate for nine-tenths of the purposes of life, and infinitely better than much that was used during the late drought.

The plan is simply this :—Choose a handy part of a brook, where the substratum is believed to be tolerably water tight and easy of excavation, and make a pit of such size, depth and breadth, as would be most convenient, right in the bed of the brook ; it would be easy to carry the water in a trough while the excavation was going on, and, being for the good of each villager, perhaps they would take a turn at it instead of their gardens for one or two evenings a week until it was finished. The only objection I see at present is, that possibly though the brook current would pass *over* the pit-reservoir the water in

it might stagnate slightly; this might be obviated by a partition of wood or brick run right down to the bottom of the pit, and having *there* an opening, the water must then be in constant motion, descending on one side, ascending on the other. A grating to prevent ingress of extraneous substances, and fence to keep out children, sheep, cattle, &c., a windlass, and perhaps, cover, would complete my small scheme, which I merely suggest, and leave others to criticise, and, perhaps, annihilate.

NOTABILIA OF JANUARY, 1866.

THE most general characteristics of the month have been its mildness, windiness, and wetness. In so large an area as the whole of the British Isles, exceptions always occur; this month the stations differing from the majority, and having had a dry month, are in the north midland counties of England, and the east of Scotland and Ireland. The south-east of England has had the greatest excess, much of which was attributable to the remarkable fall of snow on the 11th, which (as is not infrequently the case when snow falls heavily with an air temperature of 32°) was very dense, and almost sticky from its semi-fluid, semi-frozen state; such snow, of course, adheres with especial closeness to trees wet with the rain which preceded the snow; then came frost, binding all firmly on until even the telegraph wires were as thick as one's arm, and it is no wonder the break-down was almost universal in the district where the above conditions were fulfilled, which was generally the case in North Sussex, Kent, Surrey, Middlesex, Herts, and Oxford.

EXPLANATORY OF THE TABLE OF MONTHLY RAINFALL.

A very few words will suffice on this head. The order of the Stations is that in which they follow in *British Rainfall*; the Roman numerals refer to the divisions therein, and which correspond with those of the Registrars-General of England and Scotland, and of the Cattle Plague reports of the Privy Council Office. The heights of the gauges are the elevation of their receiving surfaces above the ground, and above mean sea level at Liverpool (=Ordnance Datum). The next column gives the total fall, and then follows the difference from the average of the past six years. No doubt this is a short period to adopt, but it was necessary to steer between two difficulties. If a long average (twenty years, for instance,) was held indispensable, then the stations must have been few and most irregularly distributed, or the column nearly all blanks. It has therefore been decided to adopt a medium course, and adopt the mean of the six years, 1860-5, the relation of which to the previous ten years, 1850-9, is fully shown in the annual tables for 1865, which are now in the press.

The headings of the other columns sufficiently explain themselves, save that the date of a rainfall is (in accordance with the rule now generally adopted) the day preceding that at 9 a.m. on which the amount was measured. It almost seems as if *all* had not quite understood this point, the dates this month being irregular.

RAINFALL IN JANUARY, 1866.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Diff. from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
		ft.	in.	feet.	inches.	inches.	inches.		
I.	Camden Town	0	6	100	3·90	+1·95	1·20	10	23
II.	Staplehurst (Linton Park)	0	6	200 ?	3·83	+1·77	1·35	11	21
,,	Selborne (The Wakes)	4	0	500 ?	6·23	+2·96	·73	14	20
III.	Hitchen	2	0	240	3·63	+1·49	·75	11	23
,,	Banbury	7	0	345	2·57	+ ·48	·28	31	22
,,	Wisbech	0	6	10	2·10	...	·41	22	18
IV.	Bury St. Edmunds (Culford)	1	2	...	2·48	+ ·61	1·02	13	12
V.	Calne	0	11	250	3·60	...	·50	10	20
,,	Plymouth (Goodamoor)	0	2	580	8·44	+2·42	3·76	13	20
,,	Barnstaple	0	6	31	5·44	+2·80	·70	11	23
,,	Taunton	1	6	38	5·15	+2·51	·81	11	23
VI.	Shrewsbury (Highfield)	5	6	200	2·40	+ ·78	·48	7	15
,,	Tenbury (Orleton)	0	9	200	3·00	+ ·47	·35	7	24
VII.	Leicester (Wigston)	0	6	220	2·08	+ ·10	·39	13	19
,,	West Retford	0	6	50	1·25	— ·27	·20	2	16
,,	Derby	5	0	180	1·60	— ·19	·21	12	19
VIII.	Manchester	2	7	106	3·25	+ ·76	·57	21	20
IX.	York	0	6	50	1·64	+ ·06	·26	14	17
,,	Skipton (Arncliffe)	3	0	750	10·11	+4·47	1·48	21	22
X.	North Shields	1	0	124	1·51	— ·60	·30	30	20
,,	Borrowdale (Seathwaite)	1	0	422	25·99	+9·63	3·03	21	24
XI.	Abercarn	1	3	450	8·92	...	1·10	15 & 21	13
,,	Haverfordwest	2	0	60	7·90	+2·85	1·19	6	21
,,	Rhayader (Cefnfaes)	2	0	880	7·42	+2·90	·91	2	24
,,	Llanberis (R. Y. Hotel)	1	0	370	15·85	...	2·42	2	23
XII.	Dumfries	0	5	70	5·56	+ ·96	·55	30	21
,,	Hawick	4	0	580	4·85	...	·70	8	23
XIV.	Ayr (Auchendrane House)	2	3	94	8·30	+3·78	1·42	8	24
XV.	Otter House	0	6	130	10·89	+4·19	1·39	31	25
,,	Fort William	0	8	20	14·19	...	1·25	14	30
XVI.	Leven (Nookton)	0	6	80	2·80	— ·07	·37	30	19
,,	Stirling (Deanston)	0	0	130	6·96	+2·24	1·01	1	25
,,	Logierait	1	0	250	5·01	...	·66	2	18
XVII.	Ballater	0	10	656	2·87	...	·46	20	17
,,	Aberdeen	4	8	115	2·52	...	·43	12	21
XVIII	Inverness (Culloden)	3	0	104	2·47	...	·36	5	17
,,	Portree	0	4	60	19·17	+6·08	1·35	14	31
,,	Loch Broom	0	8	48	9·00	...	·86	14	31
XIX.	Helmsdale	1	0	34	2·63	...	·25	17	26
,,	Sandwick	2	0	78	4·33	+1·04	·52	1	27
XX.	Cork	6	0	65	6·76	...	1·04	2	22
,,	Waterford	4	0	60	5·42	+ ·56	·92	2	26
,,	Killaloe	5	0	128	6·63	+1·77	·90	12	25
XXI.	Portarlington	9	0	236	3·72	— ·29	·49	13	25
,,	Monkstown	0	6	100	2·59	— ·80	·48	30	21
XXII.	Galway	6	0	25	8·96	...	·77	12	27
,,	Bunninadden (Doo Castle)	1	0	...	6·55	...	·80	3	26
XXIII	Bawnboy (Owendoon)	1	3	218 ?	7·00	..	·72	3	27
,,	Waringstown	0	4	191	3·94	...	·47	2	21
,,	Strabane (Leckpatrick)	0	5	260	7·34	...	·81	3	23

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ENGLAND.

CAMDEN TOWN.—Temperature of air above 50° on 13 days, the highest being 59° on 3rd. The temperature has seldom been known to exceed 55° in January, and there is believed to be no case on record of a temperature of 59°·0, or of 13 days with a temperature of 50°. The air only fell to freezing point on three days—11th, 12th, and 13th, but on the night of the 12th there was a short period of intense cold, a mercurial minimum thermometer *on* the snow fell to 9°·3.; the ordinary spirit thermometer only fell to 18°, but it was partially under the snow. Lunar halos on 4th, 21st, and 22nd. At 1·30 a.m. of 10th heavy rain began, lasting till 4 a.m., when it turned to snow, and by 9 a.m. the latter lay 6 inches deep, allowing for the rain; still the snow must have had a density far greater than ordinary, the total product when melted being 1·20 in.

LINTON PARK.—The most remarkable feature in the month was the snowstorm on the 11th, preceded by a heavy fall of rain, little or no frost until the evening, when the thermometer fell to 18°. Lightning had been seen on the two evenings preceding this, and the barometer fell 1·49 in. between the 8th and 11th. The snow drifted so as to render some of the lanes and highways impassable until they were cut, but with the exception of the 11th and 12th the weather was very mild.

SELBORNE.—A most tempestuous month, remarkable for rapid variations of temperature and pressure. The thermometer on the night of the 12th fell here to 15°; at Alton to 3°; at Chawton to 7°; here on the morning of the 13th it rose to 45°, being 30° in the course of the night. Loud thunder on 3rd, hail on afternoon of 8th, and aurora at night. On 11th, heavy snow from 1 a.m. to 3 p.m. Aurora on 15th, 17th, and 21st.

HITCHEN.—Heavy fall of snow commenced at 4 a.m. on 11th. Postal communication with London stopped, owing to melting snow in the valley between Stevenage and Buntingford.

BANBURY.—High winds and fluctuating barometer. Two inches of snow on the 11th, followed by high wind, from the joint effects of which the telegraph posts were broken. A little snow on 8th and 9th. Snowdrops and draba verna on 21st. No day on which the day temperature did not exceed 32°.

WISBECH.—Mean temperature of month 42°, which is 5°·3 above the average of January for six years. Air temperature only fell to freezing on five days. General health of locality good. Gale (15 lbs.) on 2nd, and (20 lbs.) on 8th. Lunar halo on 29th.

CULFORD.—The mildest January I recollect. Mean temperature 40°. Common crocus in full flower since the 8th, and, which is somewhat remarkable, it preceded the common snowdrop. Snow only fell on one day (11th), but it was then 5 in. deep.

CALNE.—Gale on 2nd; snow on the downs. Snowdrop and winter aconite in bloom on 5th. Heavy gale and hail on 8th. Snow on 9th, and 11th, four inches deep. Crocus in bloom on 18th.

GOODAMOOR.—Hail on 8th; snow on 9th. On 11th a hurricane came from E. and N.E., with hail, rain, and snow, doing great damage to the trees and buildings. It began about 1.30 a.m., and was most violent from 7.30 to 8.0 a.m. Thaw on 13th, and great floods in the rivers.

TAUNTON.—High wind on 2nd. Stormy, with snow, on 11th.

ORLETON.—A very warm and stormy month; frequent rains, but never very heavy. Some snow on 9th and 12th. Lunar rainbow on 22nd, at 9.15 p.m.

WEST RETFORD.—Great prevalence of high winds from S. and S.W. Snow on 9th and morning of 13th.

DERBY.—The fluctuation of the barometer this month has been remarkable, viz., from 28·709 in. on 9th, to 30·430 on the 26th. The gales, though frequent, have not been severe in the midland counties. The extreme mildness of the month is shown by the budding of the trees. Violets were gathered early in the month, and snowdrops are abundant.

MANCHESTER.—Snow and hail on 9th. Heavy snow early on the 12th.

ARNCLIFFE.—Very mild month, but with an unusually heavy fall of rain. Little or no snow.

NORTH SHIELDS.—Heavy storm of snow and sleet on 1st. Snow daily from 9th to 13th—also on 29th. Lunar halo on 24th, 25th, 26th, and 31st. Solar halo on 30th. Pansy in flower on 17th, Christmas rose on 18th, furze on 19th, snowdrop on 21st, blue hepatica on 27th, polyanthus and red hepatica on 28th. Unusually mild.

SEATHWAITE.—Excessive rainfall and very high temperature. Frost only on three nights. Eleven days with more than an inch of rain—five with more than two inches. Monthly gauge gave 24·86 inches. Gauge on The Stye gave 34·12.

WALES.

ABERCARN.—Rainy month; heavy snowstorm on 11th. Range of barometer 1·55 inch.

HAVERFORDWEST.—General characters of the month were extreme wetness, gloom, and a prevalence of heavy gales, chiefly from the W., S.W., and N.W. Mildness has also been a prevailing characteristic; on one occasion only has the temperature fallen actually to the freezing point. Snowdrops were in full flower about the 15th of the month. The barometer has been chiefly remarkable for uniform low pressure and readings, rather than for any unusual extremes; in a word, I may say, it has been blowing heavily for at least two-thirds of the month, the only calm period being about the 23rd to the 27th, when the readings of the barometer were high; the sky during that time was generally overcast and the air calm. The month finished stormy, mild, and wet. Lightning and hail on 1st; lightning also on 9th. Hail on 11th.

RHAYADER.—Strong gales of wind from S.W. and N.W. during the whole month. Temperature very high. Snow on 11th; large flood in the Wye on 13th, and again on the 21st. Max. temp. 54°.

LLANBERIS.—Very wet month; more than an inch of rain on six days.

SCOTLAND.

DUMFRIES.—From the 2nd to the 9th very stormy and wet, with a violent gale on the 7th. Frosty from 10th to 12th, with heavy snow on the 11th. From 13th to 21st stormy and wet, with violent gale on 15th. From 22nd to 27th, six days very fine and mild for the season, the thrush and blackbird singing in the woods. Snowdrops in flower on 20th, and common blue hepatica on 26th. The last four days very stormy and wet, with snow on the 29th. The rainfall is 1·27 in. above the average of the previous sixteen years; during that period the rainfall for January has only four times exceeded that of present month—in 1851 the amount was 7·14; in 1852, 8·10; in 1860, 7·60; in 1863, 7·10 inches. The least fall was 1855, 0·55 in. The mean temperature 41°·0, has exceeded last January by 4°·7.

AYR.—The month has been characterized by excessive rain, fluctuating pressure and temperature—the latter being generally high, extremely violent S.W. winds. The great London snowstorm did not reach here with any severity—we only had one inch of snow. Rainfall nearly double our ten years average, and more than ever previously recorded in one month.

OTTER HOUSE.—Wet and stormy; very little snow, and that little soon disappeared. Rain 4·41 in. above the average. Lightning on night of 1st and 21st, with distant thunder; hail on 8th and 15th; snow on 10th and 11th. Storms on several days; in fact, the weather since December 19th, 1865, is well described by an eminent poet in the following couplet—

"The days are cold, and dark, and dreary,
It rains, and the wind is never weary."

NOOKTON.—January, like November and December, has been singularly mild, and also like them almost without frost or snow, but frequent wind-storms mostly from the S.W. High winds throughout the month; snow on 1st, 10th, 11th (5 to 7 p.m.) 29th.

FORTWILLIAM.—Temperature throughout the month was very mild, except in the first week. A considerable fall of snow on 3rd and 4th, but it did not lie long; a little snow fell also on the 28th.

DEANSTON.—Weather throughout the month very mild for the season, only six days without rain; very little snow, and what fell, melted on the following day. Snowdrops, hepaticas, &c., in flower in the middle of the month. 2 inches of snow on 1st; slight falls on 10th, 11th, 13th, 29th, and 30th.

LOGIERAIT.—Altogether an exceptional month. At times (*e.g.*, from 22nd to 28th) we experienced lovely weather, with all the balminess of Spring, and a temperature such as none can recall for the month of January. Again we have had but very little snow, and though falling somewhat heavily upon the surrounding hills, never remained above three days. Owing partly to the melting of the snow and partly to the rainfall, the river Tay was in great flood for a fortnight, at one time gaining a height which it had not reached before for 17 years past. While we have had some wonderfully fine and spring-like weather during the month, the rainfall has been very great.

BALLATER.—Snow on 1st, 10th, 13th, 15th, 18th, 20th, and 29th, and frequent gales. Lunar halos on 24th and 28th.

ABERDEEN.—The month has been milder than usual, the mean temperature being 38°·1, which is 1°·8 *above* the mean of the ten years 1856—1865. The mean pressure 29·51 in. at sea level, is ·23 in. *below* the mean of the same period. Frequent heavy gales of short duration, but none accompanied the great depression of the barometer to 28·51 in. on 9th. On 2nd, 5 to 12 p.m., hurricane from S. and S.S.W.; on 3rd, a S.W. gale, lasting through the night. Aurora on 4th, nightly from 6th to 15th, on 17th, 21st, 23rd, 27th, and 28th. Lightning on 6th. Gale on 7th. Snow (half-an-inch) on 10th; snow also on 12th and 13th, with a gale on the latter day. Fog on 17th, and, at 7 p.m. a fine meteor with train of sparks. Lunar halos 23rd, 24th, 25th, 26th, and 28th. Snow on 29th and 30th.

CULLODEN.—Barometer 28·425 (corrected) at noon on 9th, having continued low since 31st December at 4 a.m., on which day it fell to 28·20 inches. These great depressions were caused no doubt by the severe and disastrous storms which prevailed over England and Scotland and in the Atlantic Ocean. Snow-drops in flower on 17th.

HELMSDALE.—Rain fell on every day but five; snow on 10th and 28th. The severe storm which visited the south was scarcely felt here.

PORTREE.—This has been the stormiest month ever remembered. Mean temperature 40°·4, mean pressure at sea level 29·44 inches. Minimum temperature 16·2 (on grass 9°·0) on 11th. Hail on 7 days, snow on 6 days, lightning on 21st, halo on 27th, meteors on 4th.

SANDWICK.—The month has been rather warmer and drier than usual, but a low barometer, 0·22 *below* the mean. The mean daily motion of the air has been 472 miles, against a mean of 441 miles. Thunder, lightning, and hail at 10 a.m. on 1st; hail at 3 p.m. on 7th, and again on 10th. A gale from 6 a.m. on 15th till 4 a.m. on 16th; horizontal motion 1000 miles in 22 hours, for 8 of which it averaged 50 miles an hour. On 21st there was a gale of 40 miles an hour from 2 till 7 a.m. Lunar halo at 8 p.m.

IRELAND.

KILLALOE.—The wettest January in 20 years except three, viz., 1849, 7·47; 1852, 6·85; 1860, 7·07. Frequent and violent winds throughout, mostly from S.W. Hail showers on 1st; violent storm on night of 7th from S.W. to W., and then from N.W.

MONKSTOWN.—A constant succession of gales until 22nd, those of 7th and 14th being most violent. Very little frost; min. 30°; max. of barometer 30·586 on 24th, min. 28·956 on 9th. Rain on an unusual number of days, but the amount not excessive. Temperature very mild. Fine double lunar rainbow at 8.30 p.m. on 2nd. Snow on 7th and 8th.

GALWAY.—Lunar rainbow on 20th, at 7 p.m.

DOO CASTLE.—This month remarkably wet and mild; birds singing the whole month. Snow on 1st, 8th, 9th, 11th and 12th.

OWENDOON.—Twenty-seven wet days, some very stormy ones, and some very mild; floods very high. Snow on 1st and 28th.

WARINGSTOWN.—Snow on 1st, 8th, 9th, 11th, and 29th. Heavy westerly gale on 8th. Max. temp. 54° on 15th; min. 24° on 11th. Frost on grass on 20 nights.

LECKPATRICK.—Very wet month; mild open weather; some severe gales. Sixteen nights with frost on grass. Mean temperature 39°·3 being 2·4 above Mr. Glaisher's adopted mean for January at Greenwich. Here the means have been, January, 1863, =39°·4; 1864, =38°·2; 1865, =35°·5; 1866, =39°·3.

MINIMUM THERMOMETER ON GRASS.

To the Editor of the Meteorological Magazine.

DEAR SIR,—I wish to inquire what is the usual practice of Meteorologists with regard to a point which I venture to think is not so trivial as it seems. I see frequent allusions to the "minimum on grass," and would venture to ask—What sort of grass? I have often placed thermometers on grass in different parts of our garden at Ripon, and have always found those placed on long and matted grass—such as grass that was cut for hay, or grazed generally is in winter—the lowest. 10° is the common difference, on a clear night, between a thermometer so placed, and one at 4 feet, close at hand and duly protected *on all sides* from the effects of radiation. For example, last Friday I registered the following temperatures—air 21·3, grass 7·5; and in the previous week, air 27·0, grass 16·0. I shall be very glad if any of your correspondents can clear up this question.

Charterhouse, Jan. 17th, 1866. F. W. STOW.

[The instructions hitherto issued on the placing of the minimum thermometer on grass certainly have been rather vague, and require more strict definition. Probably Mr. Glaisher's paper on the "Radiation of Heat at Night from the Earth," &c.—Phil. Trans. 1847, pp. 119–216—affords the best basis of such instructions, supplemented, perhaps, by the experience of observers generally. We may remark that when commencing observations with a thermometer on grass, we made use of a patch of turf about 2ft. in diameter, and on subsequently removing the instrument to a large grass plot the recorded minima were so much lower that we rejected all the previous readings. Has any one tried the effect of *simultaneous* readings on large and small surfaces of grass? As to the effect of variations from the length and quality of grass, the results arrived at by Mr. Glaisher were that long grass gave 1°·1 lower min. than short, and that if the thermometer was even one inch *above* the grass it would be 2°·8 warmer. There are several points well worthy of consideration. For instance, would it be well to adopt some substance of high but constant, radiating power, and not like grass varying with its daily growth; or is it better to let grass which has been our radiation measure for some years remain so, but try to make the conditions uniform at all stations. Again, the spirit minimum often reads 5° higher than Casella's mercurial minimum. Is it not imperative that *all* should use one or the other, or at any rate that it should always be stated *which* is used? Lastly, the Scottish Meteorological Society recommend a spirit minimum whose bulb is black glass, while those used in England are mostly, if not all, transparent spirit, in clear white glass. Comparison of these instruments should be made, and the results will find ready insertion in these columns.—ED.]

LATEST INTELLIGENCE.

[*Under this head we propose to notice events up to the moment of going to press, although full accounts will be reserved for the succeeding number, in order to give time for others to supply information bearing upon them.*]

THUNDERSTORM.—On SUNDAY, FEBRUARY 4th, a rather severe thunderstorm is reported from Rugby, Leicester, Chipping Norton, and various other places.

GALE AND LOW BAROMETER.—On SUNDAY, 11th, a severe gale in London. Barometer at Camden Town remarkably low—reduced to sea level it was—

9 a.m.,	29·249	3.0 p.m.,	28·663	4.15 28·619	5.30p.m. 28·615
1 p.m.,	28·835	3.15 p.m.,	·657	4.30 ·606	6.0 ·628
1.30p.m.,	·794	3.30 p.m.,	·640	4.45 ·61	7.0 ·663
2 p.m.,	·748	3.45 p.m.,	·629	5.0 ·611	9 p.m., ·802
2 30p.m.,	28·720	4.0 p.m.,	28·622	5.15 28·616	12th, 9 a.m., 29·336

Rain from Jan. 1st to Feb. 12th at Camden Town is 6·22, the average being 2·20.

Unavoidably postponed—"Low Barometer at Scottish Lighthouses," by A. Cunningham, Esq. "Aurora of October 19th, 1865," by Dr. Rankin. "Floods at Port Louis, Mauritius."

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

II.] MARCH, 1866. [PRICE FOURPENCE, *or 5s. per ann. post free*

WATER SUPPLY FOR VILLAGES.

Mr. Leyland Woods, of Chilgrove, has kindly forwarded the following details of the plan he has adopted for his villagers, scattered over some 2,000 acres of the Sussex chalk hills, a plan which has the high merit of having been long (40 years) tried, extensively adopted, and not having failed even with the drought of 1864—in fact, much was in store when fresh rains came to replenish the cisterns :—

In those districts of England where surface-springs and constant streams do not abound, or where water has to be obtained from wells of great depth, a supply of good water in reasonable abundance is often very deficient in the cottages of the labourer. To overcome this great need, each cottage or pair of cottages should be supplied with an underground tank, in which the surplus water falling on the roof during periods of abundant rainfall can be preserved for future use. The advantages of these tanks have been so beneficially felt in this village during the dry seasons of the past few years, that I venture to give the result of my experience for the benefit of those who cannot help themselves without the provident care of the owner of the cottage or farm.

Cottages should be tiled or slated, and iron or copper guttering fixed under the eaves which will convey the rainfall, first into a galvanized iron cistern, containing from 50 to 100 gallons—this will supply the daily wants of a family in wet seasons without recourse to the pump. The overflow of these cisterns must be conveyed into the tank which is underground and covered over with an arch of brick. No air or light should be admitted into these reservoirs. The water is preserved in greater sweetness and coolness than when exposed to the atmosphere. The method of building these tanks is, first to dig a hole of the required size, then build walls of stone, brick, or flint, about twelve inches thick, fill them well in with grouting or concrete against the earth, and make a concrete bottom of broken flint or brick ; cover in with an arch of brick, one or two courses in thickness, according to the strength required ; leave a man hole at the top and two holes at the ends, one to admit the water, the other for the overflow and for the admission of the lead pipe of the pump. After the walls have become tolerably dry, perhaps in a fortnight, coat the walls and bottom with a covering of good Roman cement, or with two or three courses of tiles laid in good grey lime mortar. All the work requires to be carefully and substantially done. In less than a month the tank will be ready for use, The water where admitted should not run down the walls, but empty itself through a piece of iron or earthen pipe, clear of the wall. The size of these tanks varies from 30 to 300 hogsheads, but one of 50 hogsheads will be sufficient for a pair of cottages. If the average rainfall of a district be about 30 inches, the quantity of water which would fall on the roof of a pair of good sized cottages may be estimated at about 200 hogsheads. This water will be sweet, cool, and wholesome, will require no filtering process, and is better than spring water for all household purposes, for brewing, for tea, and cooking, and especially for washing, as without soda, it will save more than half the soap.

A tank of 50 hogsheads will require to be twelve feet long, six feet wide, and six feet deep, inside measure. The hole will require to be dug out fourteen feet

long, eight feet wide, and ten or eleven feet deep, thus allowing the arch to be entirely underground. To build such a tank, there will be required 18 tons of flints, 15 tons of sand and coal ashes, 10 quarters of lime, 5 casks of cement, and about 600 bricks for the arch, if only one brick in thickness. The cost of digging out will be about 30s., or 40 yards at ninepence, and the bricklayer's work about £5, without reckoning the cost of the carriage of materials. The tank can thus be built for about £14; a galvanized cistern 36 × 30 × 24 inches would cost £2 10s., and the guttering and pump about £6. For the sum of about £22, two families can be supplied with excellent water. When wells vary in depth from 100 to 300 feet, the labour of drawing water is very great, and falls chiefly on the man on his return home from a hard day's work. With a tank the wife or child can pump as the water is required. A cottager would cheerfully pay an additional rent of ten shillings for such a supply of good water.

W. LEYLAND WOODS.

FLOOD AT PORT LOUIS, MAURITIUS.

Lat. 20° 9′ S.; Lon. 57° 31′ E.

February 12th, 1865.

THE destruction of life and property occasioned by this flood having been very great, and the investigation into its cause very complete, I have had much pleasure in extracting a brief narrative from the official report (for the loan of a copy of which I am indebted to my friend, Rev. G. H. Billington).

It appears that the town of Port Louis is not very much above high water level, and that some small streams, having their origin in the hilly country at the rear of the town, pass through it in open channels, which also act as drains. No violent floods having been experienced for many years, these watercourses seem to have been gradually encroached upon and contracted; added to this, one of them had been diverted, and some arrangement made for discharging the water by means of a self-acting syphon. It, however, acted the wrong way, and brought sea-water into the town. I gather from the report that the reasons for diverting this stream was, that a new railway station had been erected where the stream used to discharge into the harbour.

It is unnecessary to enter at any length on the description of the catastrophe; it is sufficient to picture to oneself 5 feet deep of water running through the streets in the dark, and at a rate variously estimated at from 1 to 20 miles per hour; people clinging to the trees till they were swept away, a grindstone 4 feet in diameter carried several yards, an iron boiler several miles, two cases, each containing a portable forge, washed away, one being carried right into the harbour.

A Commission having been appointed, several suggestions as to alterations and improvements in the channels were made, but they, of course, have nothing to do with the rainfall. It was clearly shown that the flood arose, not from rainfall *at* Port Louis, but on the hills at its rear. It does not appear to have arisen from the bursting of a waterspout, because then the heavy fall would have been of limited area, but it does seem that the Commissioners were fully justified in offering the following explanation:—

The Committee, then, taking into consideration that the extreme heat (mean temp. 82°·9) which had prevailed throughout the latter part of January and the early part of February, had rarefied the air to an extraordinary extent, that the usual trade winds had been considerably diminished in force, that no bad weather had been experienced for some time previous to the flood, that the utmost velocity of the wind never approached within 35 miles of its ordinary rate in a hurricane, that the barometer only fell ·206 inches between noon of the 4th and noon of the 11th, and ·312 inches between noon of the 11th, and 4 p.m. of the 12th February, and that the total rain which fell from 9½ a.m. on the 12th, to 9½ a.m. on the 13th was only 7·46 inches, do not consider that the flood of the 12th February was in any way due to the presence in the neighbourhood of this island of an ordinary cyclone; but they believe that a mass of aqueous vapour, drawn from the equator towards the island in consequence of the rarefaction of the atmosphere,

which extended to a considerable distance, meeting with the mountains in the northern and north-western portions of the island, was thrown up by those barriers in accumulated masses into a colder region than that in which they were first floating, and that the moment of complete saturation of the atmosphere having arrived, rapid condensation took place, and the aqueous vapour poured down in the tremendous flood of the 12th of February last.

Rainfall in different parts of the island from 9½ a.m. on 12th, to 9½ a.m. on 13th February, 1865.

	Inches.		Inches.		Inches.
Mont Choisy	6·57	*Port Louis.....	7·46	The Braes	12·25
Les Roches.....	9·21	Gros Caillon	10·05	Cluny	9·86
Labourdonnais	10·47	Croft-on-Righ	14·65	Gros Bois	4·03
Lucia	13·11	Espérance	10·24	Beau Vallon.....	4·87
La Gaieté	18·30	Trianon	11·62	St. Aubin	5·22

Greatest Fall in 24 hours, at Port Louis, in each year, from 1853 to 1865.

1853.	April 9 ...	2·87	1858.	Jan. 16 ...	5·04	1862.	May 25 ...	3·24
1854.	,, 19 ...	4·02	1859.	Dec. 5 ...	4·30	1863.	Jan. 13 ...	3·17
1855.	Feb. 4 ...	5·38	1860.	†Jan. 27 ...	11·65	1864.	Feb. 11 ...	2.45
1856.	April 24 ...	2·72	1861.	Feb. 16 ...	10·00	1865.	Feb. 12 ...	7·46
1857.	Jan. 28 ...	9·55						

C. MELDRUM,
Superintendent of Observatory.

REMARKABLE AURORA BOREALIS, OCTOBER 19TH, 1865.

To the Editor of the Meteorological Magazine.

SIR,—On Thursday, the 19th October, 1865, at a quarter to seven, p.m., an auroral arch, of a yellow colour, originated in the N.E. and proceeded quickly to the S.W. (Reid and Dove's poles of the wind), becoming thin and filamentary till it nearly touched the distant hills in the S.W., thus spanning the sky, and dividing it into two equal parts, as if marking out the boundary of the coming aurora. The wind was from the N.E., and seemed to bend part of the arch, sometimes to the S. and sometimes to the N. In about half-an-hour the arch slightly moving to the S. disappeared beyond the belt of Orion; when in the N.W., and in the direction of the magnetic pole, small streamers were observed, pointing to the zenith; they gradually extended to the west and east, completely filling one-half of the sky as marked by the arch, and giving a light nearly equal to the full moon. The coruscations, or streamers, were brilliant; at one time waving to the right, and at another time to the left hand. A more beautiful display of aurora borealis than this I have never seen, not even in Zetland. The aurora disappeared about 10 p.m., but the horizon to the N. continued to be illumined most of the night. Falling stars were observed at the time, followed by rain and a hailstorm.

Piazzi Smyth remarks, that "during an aurora, there is no lightning;" now, it is probable, that as lightning restores to an equilibrium the electricity or magnetism of the lower regions of the atmosphere, the aurora may do the same to the higher regions.

This aurora was observed at Selborne, Wisbech, Orleton, York, North Shields, and Haverfordwest in England; at Aberdeen, Otter House, Scourie, and Sandwick, in Scotland; at Monkstown, Galway, and Doo Castle, in Ireland.—*Symons's Rain Circular, October.*

WILLIAM RANKIN, M.D. and M.B.M.S., &c.

Otter House, 31st January, 1866.

*At Port Louis Observatory the gauge is 40 feet above ground, and 70 feet above mean sea level; the fall up to the same hour on the 11th was 2·23 inches, and on the 12th, 2·75 in.

†It is doubtful if 11·65 fell in January, 1860. The soldiers who took the observations that year did not, in my opinion, record the fall correctly. 90·34 was stated to be the fall that year, which is more than double any year before or since. Rainfall on that day is stated by the Meteorological Society of the Mauritius as 5·82 in.

RAINFALL IN FEBRUARY, 1866.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
		ft. in.	feet.	inches.	inches.	inches.		
I.	Camden Town	0 6	100	3·72	+2·50	·49	9	18
II.	Staplehurst (Linton Park)	0 6	200 ?	4·55	+3·04	·62	11	20
,,	Selborne (The Wakes)	4 0	500 ?	5·47	+3·76	·94	11	19
III.	Hitchen	2 0	240	3·28	+2·02	·70	12	20
,,	Banbury	7 0	345	2·30	+ ·87	·35	11	24
,,	Wisbech	0 6	10	2·52	...	·49	27	17
IV.	Bury St. Edmunds (Culford)	1 2	...	3·59	+2·17	·68	26	15
V.	Calne	0 11	250	3·98	...	·60	1	21
,,	Plymouth (Goodamoor)	0 2	580	6·52	+3·16	1·24	14	23
,,	Barnstaple	0 6	31	4·56	+2·48	·75	1	21
,,	Taunton (Fulland's School)	1 4	...	4·05	...	·70	1	20
VI.	Shrewsbury (Highfield)	5 6	200	2·18	+1·04	·37	7	14
,,	Tenbury (Orleton)	0 9	200	3·02	+1·45	·52	12	23
VII.	Leicester (Wigston)	0 6	220	2·78	+1·44	·48	12	19
,,	West Retford	0 6	50	2·25	+1·11	·49	11	20
,,	Derby	5 0	180	2·25	+ ·77	·31	11	20
VIII.	Manchester	2 7	106	2·98	+1·03	·44	6	20
IX.	York	0 6	50	2·50	+1·12	·68	11	22
,,	Skipton (Arncliffe)	3 0	750	9·15	+5·47	1·32	5	16
X.	North Shields	1 0	124	1·78	+ ·25	·31	11	20
,,	Borrowdale (Seathwaite)	1 0	422	19·17	+7·79	2·30	22 & 25	24
XI.	Abercarn	1 3	450	7·07	...	2·00	10	17
,,	Haverfordwest	2 0	60	5·41	+2·55	·80	10	20
,,	Rhayader (Cefnfaes)	2 0	880	6·03	+3·05	·78	6	21
,,	Llanberis (R. Victoria Hotel)	1 0	370	...	...	...	...	...
XII.	Dumfries	0 5	70	3·00	+ ·45	·42	6	17
,,	Hawick	4 0	580	4·02	...	·48	6	22
XIV.	Ayr (Auchendrane House)	2 3	94	5·30	+1·94	·78	6	21
XV.	Otter House	0 6	130	7·41	+3·49	1·07	6	22
,,	Fort William	0 8	20	9·03	...	1·55	5	25
XVI.	Leven (Nookton)	0 6	80	4·10	+2·40	1·02	14	19
,,	Stirling (Deanston)	0 0	130	5·91	+2·91	1·11	5	21
,,	Logierait	1 0	250	3·73	...	·77	5	18
XVII.	Ballater	0 10	656	3·25	...	·50	14	21
,,	Aberdeen	4 8	115	2·89	...	·87	14	23
XVIII	Inverness (Culloden)	3 0	104	2·41	...	·35	22	20
,,	Portree	0 4	60	10·90	+ ·67	1·70	5	23
,,	Loch Broom	0 8	48	9·42	...	1·42	5	26
XIX.	Helmsdale	1 0	34	4·36	...	·95	5	21
,,	Sandwick	2 0	78	5·63	+3·15	·95	5	24
XX.	Cork	6 0	65	2·61	...	·64	8	14
,,	Waterford	4 0	60	2·70	+ ·67	·49	8	22
,,	Killaloe	5 0	128	5·51	+2·60	·75	24	22
XXI.	Portarlington	9 0	236	2·99	+ ·96	·31	7	25
,,	Monkstown	0 6	100	2·30	+ ·66	·43	6	22
XXII.	Galway	6 0	25	4·64	...	·38	6 & 25	23
,,	Bunninadden (Doo Castle)	1 0	...	3·88	...	·45	6	25
XXIII	Bawnboy (Owendoon)	1 3	218 ?	4·48	...	·68	6	21
,,	Waringstown	0 4	191	2·53	...	·31	7	24
,,	Strabane (Leckpatrick)	0 5	260	4·09	...	·48	24	27

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

[ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—A wet, uncomfortable month. Vegetation very forward, until checked by frost on 18th; Lilacs in bud on 3rd; T S at 10 p.m. on 4th; sleet on 13th; snow on 26th, ¾ in. deep. Max. temp. 55°·8 on 1st; min. 25°·2 on 18th.

LINTON PARK.—Excepting from 18th to 22nd, the month has been dull and very wet, the ground being too heavy for anything to be done with it. T S on night of 4th; heavy gale on 11th, doing much damage to trees. Max. temp. 57° on 7th; min. 23° on 18th.

SELBORNE.—Very tempestuous month, on 11th a barn was blown completely down; T on 2nd; hail on 4th at 11 p.m., and on 8th at 1.30 p.m.; aurora on 10th, 12th, and 13th. Max. temp. 54°·5 on 7th; min. 22° on 18th.

HITCHIN.—Snow on 27th; L on 4th; lowest bar. for 17 years on 11th.

BANBURY.—T S on 4th at 8.30 p.m., L unusually bright and *blue;* several persons injured in this neighbourhood, but none killed. Hail, T, and aurora on 7th. High wind and T on 11th; L and snow on 12th. Bar. on 12th [? 11th] at 5 p.m., 28·483.

WISBECH.—On 4th T S, L at 6 p.m., and a gale (15 lbs.) at 8 p.m. Solar halo on 14th; Lunar halo on 25th. Bar. min. on 11th, 28·708; max. temp. 53°·8 on 8th; min 26° on 18th

CULFORD.—Heavy T S on night of 4th, vivid L and hail; snow on 13th, 26th, and 27th. Max. temp. 55° on 7th; min. 16° on 28th.

CALNE.—Hail on 4th, 7th, and 8th; L on 4th in evening; snow on 12th, 26th, 27th, and 28th. Primrose and wild strawberry in bloom on 23rd, apricot on 24th.

GOODAMOOR.—On 3rd, at 11 a.m., there came on a furious squall or whirlwind, with L and T, it only lasted 10 minutes, but ·12 in. of rain fell, many trees were blown down and buildings damaged. On 4th, loud T, and stormy at night; L also on 5th and 7th; T S on 9th and L on 11th.

TAUNTON.—Owing to the lamented death of Dr. Gillett, the return from Fulland's School has been adopted, having been kindly supplied by Mr. Reed.

ORLETON.—Warm, rainy and stormy, until 12th; frosty, with occasional snow afterwards. Violent T S on 4th from 7 to 8 p.m., with violent wind, L began in N.W. soon after dark, at 7 p.m. became brilliant, at 7.15 very loud T, at 7.28 a vivid flash of pale white L struck an elm within 400 yards of this house, at 8 p.m. the L passed off to S.E. Distant T on 7th, and L at night.

WIGSTON.—Rain more than double our average. An awful T S, with hail, on the evening of the 4th, lasting about an hour. Considering the time of year, so violent a storm is not recollected. On 7th, temp. 52° at 8.30 a.m.

WEST RETFORD.—Very high winds during the first week. On 4th, from 6 to 6.45 p.m., T S with a N.W. gale.

DERBY.—Mean max. temp. 47°·3, mean min. 34°·2; max. 53°, min. 25°.

MANCHESTER.—After the first nine days, the mean temp. was generally low.

YORK.—On 4th, T S in evening. Snow on 21st and 28th.

ARNCLIFFE.—Very wet at beginning of month, changeable afterwards. On 7th T S. Max. temp. 42° on 10th; min. 22° on 14th.

N. SHIELDS.—Snow on 5 days. Aurora on 5th, 7th (with luminous arch), 12th, and 13th. Hail on 6th, 27th, and 28th. Lunar halos on 1st, 25th, and 26th. L on 4th and 7th. Yellow aconite in flower on 4th, crocus on 7th, and heath on 17th.

SEATHWAITE.—February was distinguished by a succession of boisterous winds and heavy rains. There were 8 days with more than an inch of rain, and 4 with over 2 inches. Snow on 14th, 27th, and 28th, but only slight.

WALES.

ABERCARN.—Wet and boisterous until 15th; fine and cold afterwards. At 8 p.m. on 4th, a heavy T S. with very vivid L and a gale of wind. Very heavy rain on 10th, with high N.E. wind. Snow on 12th, 13th, and 25th to 28th.

HAVERFORDWEST.—February has furnished almost every variety of weather; exceedingly stormy, with low barometer pressure; at times very mild, uniformly

wet, yet no very heavy falls, the heaviest, ·80, on 10th, accompanied by a severe gale. About this date the weather became much colder, and continued so with varying degrees of severity to the end of the month. The 17th and 18th, and from 25th to the end were characterized by much severity, which affected the health of the community very sensibly, the more so coming at the close of so remarkably mild a winter. Very stormy at night on 4th, with T S and heavy rain. L on night of 16th and 26th. First snow this winter on 13th.

RHAYADER.—T S at 2.30 p.m. on 3rd; and a heavy T S with extremely vivid L at 7 p.m. on 4th. Snow on 13th, 27th, and 28th. Tom Thumb geranium in full leaf in open ground, unprotected, on 8th; snowdrops, crocuses, &c., in blossom. Thrushes singing during the whole month.

SCOTLAND.

DUMFRIES.—Stormy, warm, and wet, frequent snow after 12th. On evening of 7th a beautiful luminous arch, double the breadth of a rainbow, spanned the heavens from E. to W., and from horizon to horizon. The bow was white, pure and brilliant, of a fleecy-looking texture, through which the stars were visible, particularly the Pleiades. The bow was visible about an hour, disappearing about 8.30 p.m. There was sheet L before and after the appearance of the arch, and after midnight a bright aurora.

HAWICK.—Snow on 26th, 27th, and 28th.

AYR.—Snow on 13th (4 in. deep), 14th, and 24th. Hail on 3rd and 8th. T S at night on 8th; L at night on 22nd. On 6th, at 10.10 a.m., a heavy squall from W.S.W.; only lasted 4 minutes, but blew down 11 trees, all laid to N.E. Max. temp. 51° on 4th. Min. 22° on 17th.

OTTER HOUSE.—Weather more like beginning of winter than of spring. Stormy. Rain nearly double our average, alternating with hail and snowstorms. T S on 3rd, 7th, and 9th. Aurora on 7th, 12th, and 13th. On 15th, 6 inches of snow. Snow still (28th) on distant hills, but it has all gone from the valleys; it has, however, become colder, and the ther. is at 19°, being the lowest this winter.

FORT WILLIAM.—Gale from S.W. on 5th. T on 7th. Snow on 13th, 23rd, 25th, 27th, and 28th, with hard frost on the last day.

NOOKTON.—Severe wintry weather, frost, snow, and high winds. Min. 23° on 21st.

DEANSTON.—Very stormy on night of 3rd, with hail and some L. Great gale on night of 4th; many trees uprooted. Snow on 13th, 8 in. deep. T and L on 21st. Frequent snow and hail showers, and wet stormy weather. Max. temp. 47°·4 on 1st. Min. 16°·8 on 21st.

LOGIERAIT.—Upon the whole a fine month, but we have had two heavy falls of snow, and more frost than in any previous month this winter. On the 28th the Highland Railway became blocked with snow, for the first time this season.

BALLATER.—A very stormy month; several gales, the strongest on 6th, uprooting trees, and doing other damage. Bright aurora at 11 p.m. on 5th. Remarkable meteor at 8.45 p.m. on 22nd.

ABERDEEN.—Hurricane from W. on 6th. L on evenings of 4th, 7th, 15th, and 22nd. Aurora every night but 8, viz., 2nd, 14th, 18th, 19th, 21st, 22nd, 26th, and 28th. The aurora on 7th was magnificent; one brilliant arch in N., another crossing the sky south of the zenith (through Orion) from W.N.W. to E.S.E. At times vivid flashes of L, when the second arch *disappeared*, reappearing again in a few minutes. The coincidence of the L, and the disappearance of this arch, happened more than once.

CULLODEN.—Very heavy S. to W.N.W. gale destroying many trees on 6th. T on night of 2nd, L on 6th, and T S on 22nd. Snow on 12 days.

PORTREE.—Colder and more stormy than usual, so much so, that the fishermen rarely got out to sea. The gale from midnight of 5th, to noon of 6th, did a great deal of damage, especially about 5 a.m. The church and manse of Snigort were much injured, most of the slates and lead roofing being taken off, and the windows blown in. Aurora on 13th, so bright as to cast strong shadows. T S on 4th, from 2 to 3 p.m, L all the evening; T on 5th; T S on 6th, from 4 to 6 a.m.; on 9th, at 7 p.m.

LOCHBROOM.—Weather very changeable, frost, rain, and snow constantly alternating; frequent heavy gales.

HELMSDALE.—Changeable and disagreeable month; a succession of violent gales until 9th. Snowdrops in flower on 1st.

SANDWICK.—Rain double the average; temp. below it. Gales on 6th, 7th, and 23rd, of 50 miles an hour. T S on 22nd. Aurora on 9 nights; on 14th with well defined arch. Remarkable fire-ball on 22nd, about 8.30 p.m., larger than the moon, and moving from N.E. to S.W.

IRELAND.

WATERFORD.—February is usually one of our driest months, but this year it has been damp and drizzling, and the latter part very cold.

KILLALOE.—The wettest February but one (1848 = 7·76) for 20 years, with sudden changes and violent winds. On 4th, at 1.30 p.m., violent storm, continuing till night, at 4 p.m. T S, and much sheet L at night.

MONKSTOWN.—Severe gale at 9 a.m. on 4th; bright sheet L at 8 p.m. in S.E.; no clouds at the time. Bright aurora with arch, but no streamers, on 7th. On 16th a heavy fall (about five miles from here) of *pellets* of snow, which in 15 minutes covered the ground some inches deep.

GALWAY.—On 7th, aurora, followed by T.

DOO CASTLE.—A wet month, with frequent snow. T S on 2nd and 4th, at night.

OWENDOON.—First severe month this winter; last few days intensely cold. T on 8th.

WARINGSTOWN.—Very stormy and wintry month; latter part generally frosty, with snow. Tremendous squalls, with T, L, and hail, on 4th.

LECKPATRICK.—Very similar month to February, 1865; same mean temp., same number of frosty nights, but rather more rain. Snow at times.

THUNDERSTORM ON FEBRUARY 4TH.

In addition to the many notices given in the Observer's Notes, the following are interesting, as showing how general, and how nearly simultaneous was the storm on this evening:—

RUGBY, 4th February, 1866.—(Frederick Fuller, Esq.)—A severe storm of lightning, wind, hail, and rain, commenced at 6.30 p.m., and lasted until 8.30 p.m. Wind S.W. Thermometer 42°; barometer (corrected) 29·533. The amount of rain and hail that fell was ·34 of an inch. The storm commenced to the north of the town, and went round by the west to the south. The previous part of the day had been windy and unsettled.

CHIPPING NORTON, KINGHAM.—(Rev. J. W. Lockwood.)—We had a violent hailstorm, with vivid lightning for about ten minutes. Although the hail was very heavy, no damage was done.

LINCOLN.—A terrific storm of thunder and lightning, with hail, rain, and fierce gusts of wind, broke over Lincoln on Sunday evening. The flashes of lightning were awfully vivid and brilliant, while the thunder burst forth in majestic peals, the rain meanwhile pouring down in torrents, and the wind raging with great violence. Altogether it was a most fearful storm, and produced terror and alarm in the minds of many, the congregations at the various places of worship being evidently greatly affected. Such a phenomena at this season of the year is of very rare occurrence. We have not heard of any serious damage being done by it. The west window of St. Nicholas' Church, Mewport, was blown in, and also several squares of glass in the other windows. The congregation became greatly alarmed thereby, and many rose to leave the edifice, but happily, through the exertions of two or three gentlemen, their fears were quieted, and the service was proceeded with.

MARLBOROUGH COLLEGE.—(Rev. T. A. Preston.)—We had no storm here, but lightning was seen, and at Salisbury there was a heavy thunderstorm with hail, between 11 p.m. and midnight.

BROMSGROVE.—(G. Dipple, Esq.)—Violent thunderstorm from 7.30 to 8.30 p.m.

BAROMETER DURING THE GALE OF DECEMBER 31ST, 1865.

Northern Lighthouse Office, Edinburgh,
February 2, 1866.

SIR,—Will you permit me to direct attention to the following remarkable facts connected with the barometer on the occasion of the late severe storm of 31st December last?

The Commissioners of Northern Lighthouses get from all their lighthouse stations monthly statements which embrace a daily return of two readings of the barometer. The lightkeeper at the Butt of the Lewis (170 feet high) returned the lowest reading of the barometer during the gale of the 31st December last as 27·50, which, reduced to the sea level, gives 27·691. There could be no mistake in the figures, as they were twice distinctly stated; but it was so unprecedentedly low for this climate that it could scarcely be credited. It is very remarkable how general the fall on the north and north-west coasts of Scotland has been, and how completely the return of the Butt lightkeeper is borne out. I send you a note of some stations with the actual return, the height of the lighthouse, and the reading reduced to the sea level:—

	Actual Return, lowest reading on Dec. 31, 1865.	Height of Lighthouse.	Return Reduced to Sea Level.
North Unst, Shetland	27·76	230	28·01
Whalsey Skerries, do.	27·85	145	28·01
Bressay, Lerwick, do.	27·97	105	28·09
Sumburgh Head, do.	27·80	300	28·13
N. Ronaldshay, Orkney	27·88	140	28·03
Start Point, do.	28·00	100	28·11
Hoy Lowlight, do.	27·57	55	27·63
Cantick Head, do.	27·91	115	28·04
Noss Head, Caithness	28·00	175	28·19
Pentland Skerries do.	28·04	170	28·23
Dunnet Head, do.	27·73	346	28·11
Holburn Head, Thurso	28·01	75	28·10
Cape Wrath, Sutherland	27·76	400	28·20
Stornoway	28·43	56	28·50
Island Glass, Harris	28·16	130	28·31
Ushenish, South Uist.	28·80	176	28·00
Barra Head, Barra	27·44	680	28·14
Monach, W. of Hebrides	27·75	150	27·92
Skerryvore	28·24	150	28·39

Even on the north-west coasts of the mainland the effects were felt—

Rona, Skye	27·79	222	28·04
Ardnamurchan	28·08	180	28·28
Sound of Mull	28·30	65	28·38
Lismore	28·30	105	28·42

These quotations are all, even the highest, unusually low, and may prove interesting to scientific inquirers on such subjects.—I am, &c.,

ALEX. CUNNINGHAM, *Sec.*

[The gale on 31st, blew at Sandwick (at 7 a.m.), 60 miles per hour. At Culloden, at 4 a.m., 31st, the barometer fell to 28·20 in., fully corroborating the above remarkably low readings.]—ED.

ON A PERIODIC (?) FALL OF SOFT HAIL, OR SNOW-BALLS, ON MARCH 8TH.

The following paragraph in my "Meteorological Report," for March, 1859, published in the *Times* early in April of that year, I reproduce verbatim, and append fuller details, since subsequent experience seems almost to have rendered the supposed periodicity an established fact :—

1859.—March 8th, from 4.45 to 4.58 p.m., an ordinary hail shower from N.W.; at 5.20, another nimbus from the same point began to discharge balls (stones I cannot call them, as they were soft, like miniature snowballs of ·2 inch diameter), which whitened the ground, and drifted in clouds like sleet, though when melted they only yielded ·02 inch of water.

There was much positive electricity, and the temperature fell nearly 13 degrees. The delicate rose-pink of the clouds around the setting sun contrasted with the dark hail-cloud hurrying away to S.E., had a very beautiful effect.

At Bungay (Suffolk) a violent thunderstorm from N.W., at 11.30 a.m.

It is perhaps worthy of note, that on the same day, in three successive years, a somewhat similar fall has occurred ; the large hail-balls of March the 8th, 1857, will probably be remembered by many, even of your unscientific readers, as being an inch in diameter, and lying on the ground two or three inches thick ; and further, Luke Howard, in his valuable "Climate of London," records a fall of "soft hailstones" on the corresponding day 40 years before (1817), his sketch of which strikingly resembles the photographs taken by Mr. Glaisher in 1857.

The paragraph in Luke Howard's "Climate of London," Vol. II., p. 325, is :—

1817, March 8th.—Windy ; snow in flakes about 1½ in. in diameter ; sleet and rain ; at noon large cumuli in N., passing to cumulo strati, the sky above them being blue, to 15° of the cyanometer. About 2 p.m. a sudden shower of hail from a dense lofty nimbus; the balls were opaque, in the form of a cone, with a rounded base, about half an inch in diameter, and composed entirely of striæ, meeting at the apex of the cone. We have had similar hail repeatedly of late.

I next quote from my observation book, the account of the fall in 1857 :—

1857, March 8th.—Till 11 a.m. fine ; at 11.18 a.m., hailstorm, which reduced the temperature of the air from 45·4 to 35·0 ; fair till 3 p.m. At 3.5 a very black cloud coming in a N.N.W. current, discharged balls of solidified snow, which till 3.12 did not exceed ½ an inch in diameter ; by 3.15 they had increased greatly in size and number, the size of many of them being 1 inch long, and ½ to ¾ of an inch in diameter, the number being such as to cover the ground 1½ or 2 inches deep ; they had also at this time assumed a most remarkable uniformity of shape and structure, presenting somewhat the appearance of a freshly-broken piece of iron pyrites, only crystallized at a somewhat more acute angle ; they ceased even more suddenly than they began, for at 3.25 the sun was shining brightly ; at 3.45, however, another change occurred ; a very high wind suddenly arose, bringing with it a very heavy fall of snow, which again brought the temperature down so much, that the snow which fell on (or rather covered) my coat, was immediately converted into a tissue-like sheet of ice ; this also was of short duration ; it ceased at 4.5 p.m.

9th.—Several showers of snow in the early part of the day, but at 5.5 p.m. a very heavy one commenced, the wind being N.W., it shifted to N. and snow fell ; to E. hail fell, and kept on oscillating N., bringing snow, and E. hail ; this only lasted about 10 minutes.

10th.—A small quantity more snow.

Of the fall in 1858 no record is preserved, save that hail fell, and the depth when melted was ·047 in. The account of the fall in 1859 is given above. In 1860, a little snow fell. Nothing fell in 1861 or 1862. In 1863, hail fell at 2.15 and

4.45 p.m. In 1864, there was a fall of ·030, but, being from home, I am not certain of its form; snow was reported in the neighbourhood. In 1865, there was a fall of snow at 4 p.m. (Snow also fell on 9th, and on 10th at 3 p.m.)

Lastly, in 1866 the fall of snow-balls, or soft hail, commenced at 0.50 p.m., when the temp. was 42·0, and the wet bulb 39·4, wind N., and the previous temp. 47·2; they ceased about 1.20, when the temp. had fallen to 34°·8 and 34°·6, the air having thus fallen 7° and become saturated with vapour in half-an-hour—the temperature fell altogether 12°, but part of the decrease was *before* the actual fall of the balls. They were tolerably regular in form, the usual pyramid with a cauliflower-like base, but were not so regularly striated as I have generally seen them; their temperature was 28°·5, they covered the ground about ·2 in. deep, and their density was about 5 times that of ordinary snow, and about a third that of water or ice. T was heard at 1.22, and L seen at 1.27 p.m.

A few flakes of snow at 8.30 a.m. on 10th.

During the last ten years snow or hail has fallen at Camden Town 37 times in March. On the 8th it has fallen 8 times, on the 9th 5 times, on no other day more than twice, and on 13 days it has never fallen.

I have tried to test by Mr. Glaisher's Quarterly Reports to the Registrar-General, 1853–65, the relative frequency of snow and hail on each day in March. The result is a marked excess on 8th, and 9th, but none is reported in 1853–54, or 1856. Secondly, I have taken out from Howard's "Climate of London," every day on which snow or hail occurred during the 25 years, 1806–30, and I find therefrom that hail fell oftener on March 13th, than on any other day in the year, and that snow was very frequent on March 6th, 7th, 10th, and 11th; more so, in fact, than on most days in January. Taking snow and hail together, they fell on 6th, 10th, 11th, and 13th, twice as often as the average of the month.

I wish to avoid anything like special pleading in favour of a periodicity I should have been foremost to criticise; I therefore leave the above facts to fight their own battle; it is certainly novel to hear a periodic hailstorm spoken of as coolly as a periodic display of shooting stars—but it must not be shelved because it is novel: it has occurred on the same date in every year since 1857, except 1861 and 62. that is to say, 8 years out of 10.

METEOR ON FEBRUARY 22ND, 1866.

From the Notes on the Month, it will be seen that this was seen at Sandwick 8.30 p.m., larger than the moon, moving from N.E. to S.W.; Ballater 8.45 p.m. It was also seen at Wick, Thurso, Keith, New Pitsligo, Crieff, and Aberdeen; also as far S. as Halifax. I append abridgments of three reports.

WICK.—*(John o'Groat's Journal.)*—"This evening a meteor of remarkable size and brilliancy passed from E. to W.; as it descended a cone of intensely luminous matter was distinctly visible in advance of the trail, when all at once it exploded into a shower of sparks and disappeared, the explosion sounded like a short, dull peal of thunder. The light was of a bluish tinge, threw strong shadows, lightened up dark rooms, scared horses, and frightened more than one traveller."

KING'S CROSS, HALIFAX, YORKSHIRE.—(Rev. J. Gledhill.)—About 8.15 p.m. saw a fine fire-ball in N., about 50° above horizon. Its path was an apparently horizontal line towards N.N.E., and extended at least 90° in that direction. Its motion and light were uniform; colour, silvery white; no trail, nor luminous haze. Larger than a 1st magnitude star.

MUTHILL, CRIEFF.—(Rev. A. J. T. Morris.)—At 8.45 p.m. a brilliant meteor suddenly appeared in the N.N.E., 50° above the horizon; it was dazzlingly bright, bluish white, and about a sixth the size of the moon; it hovered for a moment, then fell slowly about 12° slanting slightly to N. It then changed from spherical to oval, became red, and threw out a tail 5° long, but continued its course for 10° more, when it resumed its original colour and form and disappeared suddenly, without explosion or fracture, in due N., about 20° above the horizon. I believe its disappearance arose solely from its passing behind a thick cloud.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

III.] APRIL, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

EQUIVALENT EXPRESSIONS OF WIND FORCE.

THERE is probably no branch of Meteorology for which so many tables have been given, as for the conversion of the various wind scales into terms of one another. Having been frequently asked to epitomize and analyse them, I have lately done so with a most unsatisfactory result. I have found among the books on my own shelves at least a dozen tables, scarcely two of which are in exact accordance, while several have one or more numerical errors, and none agree in the names to be assigned to the various forces. For these reasons I have abandoned my original intention of placing them all in juxtaposition, and drawn up the following short table, which, it is hoped, will suffice for all ordinary purposes. I desire, however, in the first place, to lodge a protest against the possibility of obtaining any *simple* rule for the conversion of velocity into pressure, and *vice versa*; because the momentum of a body varies with its density: hence, if the barometer be at, say 28 inches, the pressure of any wind will be less than if the barometer were at 30 inches, the velocity in each case being the same, since each cubic foot of air would weigh about 36 grains more then, than at 28 inches.

It is a pity that two estimation scales (0—6 and 0—12) have been introduced; but it seems impossible to displace either, since each has its advantages: 0—12 is so generally used at sea, and has been so associated with the sails, &c., a ship can carry, that its displacement is undesirable; and the land scale 0—6 is very good, because, by squaring the numbers, we obtain directly the pressure in pounds per square foot. These, then, are the advantages of each, and seem such as to render it probable that Meteorologists will long have to endure the confusion arising from uncertainty as to which scale has been used.

RULES FOR CONVERSION IN CASES NOT GIVEN IN THE TABLES.

Lind's Gauge into pounds per square foot. — Multiply the height of water-column in inches by 5·2, and the result will be the equivalent pressure in lbs.; *e.g.*,—If Lind shews 3·8 inches, then 3·8 × 5·2 = 19·76lbs.

Lind's Gauge into miles per hour.— Proceed as before, and take the equivalent in miles from Table II.; *e.g.*—Lind 3·8 × 5·2 = 19·76lbs., which again (Table II.) equals a velocity of 63 miles per hour.

Velocity into pressure.—This is very undesirable; but the Rule most generally adopted is—Multiply the square of the velocity in miles per hour by ·005; *e.g.*—42 miles per hour—then 42 × 42 = 1764 × ·005 = 8·81bs. per square foot.

GENERAL CONVERSIONS.—TABLE I.

ESTIMATION.		INSTRUMENTAL.			POPULAR DESCRIPTION.
Beaufort, or Nautical Scale.	Land Scale.	Lind's Gauge.	Pressure per sq. foot.	Velocity, per hour.	
0—12	0—6	inches.	lbs.	miles.	
0	0	0	0	0	Calm.
1	·5	·05	·3	8	Gentle breeze.
2	1·0	·19	1·0	14	Moderate ,,
3	1·5	·43	2·3	21	Fresh ,,
4	2·0	·77	4·0	28	Very fresh.
5	2·5	1·20	6·3	35	Strong.
6	3·0	1·73	9·0	42	High wind.
7	3·5	2·36	12·3	50	Moderate gale.
8	4·0	3·08	16·0	57	Gale.
9	4·5	3·89	20·3	64	Fresh gale.
10	5·0	4·81	25·0	71	Strong ,,
11	5·5	5·82	30·3	78	Storm.
12	6·0	6·92	36·0	85	Hurricane.

PRESSURE CONVERTED INTO VELOCITY.—TABLE II.

Pressure	Velocity	Pressure	Velocity	Pressure	Velocity	Pressure	Velocity	Pressure	Velocity
lbs.	miles.	lbs.	miles.	lbs.	miles.	lbs.	miles.	lbs.	miles.
·1	4	4	28	16	57	28	75	40	89
·2	6	5	32	17	58	29	76	41	91
·3	8	6	35	18	60	30	77	42	92
·4	9	7	37	19	62	31	79	43	93
·5	10	8	40	20	63	32	80	44	94
·6	11	9	42	21	65	33	81	45	95
·7	12	10	45	22	66	34	82	46	96
·8	13	11	47	23	68	35	84	47	97
·9	13	12	49	24	69	36	85	48	98
1·0	14	13	51	25	71	37	86	49	99
2·0	20	14	53	26	72	38	87	50	100
3·0	24	15	55	27	73	39	88		

NOTE.—It should perhaps be mentioned that the above tables have been computed on the assumptions (1) that a cubic-foot of water weighs 62.4lbs: (2) that the square-root of 200 times the pressure equals the velocity. This value has been most generally adopted, and is near the average of all the best tables.

WELLS, THEIR TEMPERATURE AND DEPTH.

IT is by no means easy to foresee the branches of water measurement which will yield the *most* useful results, but it is impossible to deny that long and well kept records of the depth at which the water stands and has stood in bygone years would be of great use. Obviously they afford our best test of the condition of the ceaseless underground streams, and give us a better measure of the rainfall penetrating the earth's surface than any percolating gauge ever devised. Careful observations should teach us the rate and amount of percolation through the different geological formations, and would, in all likelihood, lead to many unexpected and useful results.

Again, so far as we are aware, no observations on the temperature of well water have been published except in Scotland, and there we find no record of the depth of the water below the surface, on which obviously the range of its temperature largely depends.

Believing that these two points are worthy of careful watching, we submit the following *suggestions*, trusting that they may act as a basis on which explicit rules may be framed, and that they may be freely criticised.

(1.) *Depth of water.*—Probably the easiest plan will be to have tapes (like measuring tapes), with a small disc attached, which on reaching the water should both produce a ripple and a slight sound.

(2.) Should the well be *very* deep, and light deficient, a small hand-mirror would, perhaps, reflect sufficient light.

(3.) The most *convenient* mode of observing, and one that might readily be made self-recording, would be to have a float attached to a long iron rod, which would then rise and fall with the level of the water, and its height could be noted with the greatest ease.

(4.) The measurement must be from some permanent mark on the framework of the well, or other well-defined object. The height of this point above mean sea level should be ascertained if possible.

(5.) It should be measured at some *regular* time, as well as at such irregular ones as the observer may please; but the *regular* measurement should be when the well has been as little interfered with as possible. (*Query*, Would not every Monday morning be a good time?)

(6.) Until the plan is regularly arranged, observers should err by taking too many observations, and writing too copious remarks rather than otherwise.

(7.) *Temperature of the Water.*—Considerable care must be used in selecting a thermometer for this purpose, (should a sufficient number of observers desire it, special thermometers could *probably* be prepared for 10s. 6d. each), and with such, some interesting points might be cleared up. For example, the following table shows how closely the *mean* temp. of well water approaches the mean temperature of the air, though its *range* of temperature is infinitely less; hence the scale of a well-water thermometer must be rigorously correct between 35° and 55°, but need not probably pass those points. Every temperature record should state the depth from which the water is drawn, and the first should specify the geological formation.

(8.) The temperature should be ascertained by simply drawing a bucket of water, and stirring the thermometer in it until it ceases to vary. This is believed to be far preferable to lowering a thermometer into the water, as it is liable to change between leaving the water and reaching the observer. Where a pump is affixed, it is probable that after pumping a bucket or so, the water would have the true well temperature, and a thermometer held in the spout would show it correctly.

TEMPERATURE OF WELLS IN SCOTLAND, 1864.

	Sandwick.		Arbroath.		Barry.		Otter House		Smeaton.		E. Linton.		Thurston.		Cargen.	
	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.
Jan. ...	38·5	46·0	37·6	47·0	36·3	44·7	36·5	45·7	35·6	45·4	37·0	48·0	35·0	46·4	36·0	47·8
Feb. ...	34·6	45·7	35·5	46·0	35·3	43·7	32·8	44·9	33·7	45·6	34·2	48·0	33·3	45·1	34·8	48·1
Mar....	37·0	44·7	39·2	46·5	38·6	42·0	37·0	44·8	38·3	45·0	40·4	48·0	37·4	45·5	39·4	47·9
April..	44·5	44·9	46·9	46·2	46·5	43·2	45·3	45·6	47·6	46·1	47·6	48·0	45·2	45·3	47·4	47·8
May ...	46·6	45·4	50·2	46·5	50·2	45·7	50·7	46·5	51·4	46·8	49·6	49·0	48·8	46·1	52·4	47·9
June...	51·2	45·7	56·0	47·0	55·0	46·4	53·2	47·7	55·4	47·8	55·0	48·0	52·9	45·5	54·8	48·0
July ...	54·2	46·6	58·1	47·7	57·1	48·2	56·4	48·6	58·0	47·6	57·6	49·0	54·9	45·9	60·3	48·0
Aug....	52·6	47·5	56·5	48·5	55·7	49·2	53·0	48·8	56·0	47·8	56·0	49·0	53·8	45·9	56·4	48·0
Sept ...	52·0	47·1	54·0	48·5	53·8	49·2	51·3	48·0	53·6	47·6	54·3	49·0	52·0	46·0	54·2	48·0
Oct. ...	45·9	47·0	48·1	48·5	47·6	49·2	44·4	47·2	46·0	47·6	46·4	49·0	45·4	46·2	48·1	48·0
Nov. ..	43·4	46·4	42·2	48·0	41·4	47·8	39·6	46·3	40·6	48·0	41·7	49·5	40·5	45·4	42·0	48·1
Dec. ...	41·7	46·0	40·7	46·5	39·8	46·7	38·3	45·6	39·5	47·6	40·2	49·8	39·2	45·9	40·2	48·1
Mean..	45·0	46·1	47·1	47·2	46·4	46·3	44·9	46·6	46·3	46·9	46·7	48·7	44·9	45·8	47·2	48·0
Max...	54·2	47·5	58·1	48·5	57·1	49·2	56·4	48·8	58·0	48·0	57·6	49·8	54·9	46·4	60·3	48·1
Min....	34·6	44·7	35·5	46·0	35·3	42·0	32·8	44·8	33·7	45·0	34·2	48·0	33·3	45·1	34·8	47·8
Range.	19·6	2·8	22·6	2·5	21·8	7·2	23·6	4·0	24·3	3·0	23·4	1·8	21·6	1·3	25·5	·3

RAINFALL IN MARCH, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft.	in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	1·69	— ·39	·41	23	17
II.		Staplehurst (Linton Park)	0	6	200 ?	2·27	— ·22	·54	24	17
,,		Selborne (The Wakes)	4	0	500 ?	2·72	+ ·12	·79	23	12
III.		Hitchen	2	0	240	1·28	— ·89	·42	24	13
,,		Banbury	7	0	345	1·33	— ·88	·23	23	17
,,		Wisbech	0	6	10	·95	...	·19	17	13
IV.		Bury St. Edmunds (Culford)	1	2	...	1·30	— ·90	·26	17	11
V.		Calne	0	11	250	2·01	...	·51	23	13
,,		Plymouth (Goodamoor)	0	2	580	4·42	— ·74	·76	15	18
,,		Barnstaple	0	6	31	3·23	+ ·08	·61	23	15
,,		Taunton (Fulland's School)	1	4	...	3·44	...	1·16	24	10
VI.		Shrewsbury (Highfield)	5	6	200	1·42	— ·72	·31	13	11
,,		Tenbury (Orleton)	0	9	200	2·31	— ·11	·45	23	19
VII.		Leicester (Wigston)	0	6	220	1·27	— ·84	·24	17	15
,,		West Retford	0	6	50	1·22	— ·72	·27	6	17
,,		Derby	5	0	180	1·72	— ·53	·41	17	18
VIII.		Manchester	2	7	106	2·17	— ·46	·35	17	13
IX.		York	0	6	50	1·35	— ·64	·44	7	15
,,		Skipton (Arncliffe)	3	0	750	3·60	—1·21	·74	6	13
X.		North Shields	1	0	124	2·47	+ ·12	·53	6	22
,,		Borrowdale (Seathwaite)	1	0	422	13·05	— ·35	3·30	24	17
XI.	WALES.	Abercarn	1	3	450	3·84	...	·76	23	14
,,		Haverfordwest	2	0	60	5·39	+1·94	1·70	24	19
,,		Rhayader (Cefnfaes)	2	0	880	3·93	+ ·09	·61	17	17
,,		Llanberis (R. Victoria Hotel)	1	0	370	5·91	...	1·83	23	14
XII.	SCOTLAND.	Dumfries	0	5	70	2·03	— ·95	·51	28	13
,,		Hawick (Silverbut Hall)	4	0	512	1·93	...	·28	26	18
XIV.		Ayr (Auchendrane House)	2	3	94	2·13	—1·60	·44	23	14
XV.		Otter House	0	6	130	4·43	— ·21	1·03	24	16
,,		Fort William	0	8	20	3·68	...	1·01	29	18
XVI.		Leven (Nookton)	0	6	80	2·02	— ·05	·67	6	18
,,		Stirling (Deanston)	0	0	130	2·75	— ·78	·50	23	20
,,		Logierait	1	0	250	4·31	...	1·12	23	16
XVII.		Ballater	0	10	656	7·04	...	1·50	6	18
,,		Aberdeen	4	8	115	3·21	...	·71	6	20
XVIII		Inverness (Culloden)	3	0	104	...	...	...	...	...
,,		Portree	0	4	60	6·40	—2·64	1·24	5	21
,,		Loch Broom	0	8	48	3·73	...	·51	29	27
XIX.		Helmsdale	1	0	34	2·13	...	·23	12	22
,,		Sandwick	2	0	78	3·08	— ·25	·33	30	23
XX.	IRELAND.	Cork	6	0	65	3·98	...	1·29	14	18
,,		Waterford	4	0	60	3·51	+ ·62	·72	14	18
,,		Killaloe	5	0	128	3·85	— ·47	·98	23	22
XXI.		Portarlington	9	0	236	2·92	— ·39	·85	23	24
,,		Monkstown	0	6	100	4·15	+1·57	1·17	23	19
XXII.		Galway	6	0	25	3·29	...	·50	14	25
,,		Bunninadden (Doo Castle)	1	0	...	2·93	...	·59	23	23
XXIII		Bawnboy (Owendoon)	1	3	218 ?	3·29	...	·68	23	22
,,		Waringstown	0	4	191	3·08	...	·65	23	21
,,		Strabane (Leckpatrick)	0	5	260	2·64	...	·52	23	25

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

[ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Snow on 1st, 8th, 10th, 13th, and 22nd, but in very small quantities, except on 8th (for description see "Meteorological Magazine," No. 2, page 18.) The 15th was remarkable for the extreme dryness of the air; lunar halo on 27th. Max. 65°·2 on 29th, in sun 106°·2 on 30th; Min. 22°·5 on 1st, and on grass 14°·2 on the same day.

LINTON PARK.—Less wind than usual, except on 23rd, when we had a gale at night, blowing down several trees. Snow on 7th, 8th, 13th, and 21st. Max. 65° on 29th; min. 22° on 1st.

SELBORNE.—Snow on 1st, 4th, 5th, 15th, 21st; hail on 9th, at 5 p.m., also on 24th. Aurora on 6th, 9th, 16th, 19th. Max. 57° on 29th; min 17°·5 on 1st.

WISBECH.—Dull showery month; gale 15½ lbs. on 23rd at 9 p.m.; snow on 13th at 7 p.m.; hail on 7th, and at noon on 21st. Aurora on 18th, at 10 p.m. Solar halos on 18th and 23rd. Max. bar. 30·418 on 10th; min. 29·024 on 24th. Max. temp. 63°·5 on 29th; min 21°·1 on 1st.

CULFORD.—Rather less wind than is usual in March, except that on the night of the 22nd (23rd ?) when it blew quite a hurricane, unroofing buildings, and blowing down chimneys. Max. 61° on 29th; min. 23° on 1st.

GOODAMOOR.—Frost on 18 mornings; tremendous gale all the afternoon of 23rd from S.E. through S. to W. and N.W., with much rain; snow on 1st, 7th, 8th, & 13th.

BARNSTAPLE.—Max. bar. 30·42; min. 28·97 in. Max. temp. 60°·5 on 27th; min. 19°·0 on 1st.

ORLETON.—Generally cloudy, dull, and cold; snow at 6 p.m. on 4th, also on 5th, 6th, 13th, 15th, 21st. On 18th, distant T in S. and W. Violent wind and rain on 23rd.

WIGSTON.—Mean temp. below the average; the rainfall was also below it, although the month was damp throughout. Very stormy on 23rd, especially at night.

WEST RETFORD.—A dull, cold month, with occasional snow showers. High wind on 23rd; bar. 28·77. Frost on 18 nights. Min. 15° on 1st; max. 65° on 29th.

DERBY.—No high winds; wet, cheerless, and unfit for gardening operations.

MANCHESTER.—With the exception of the last week, the mean temp. was generally below the average.

YORK.—Snow on 4th, 6th, 13th, and 22nd.

ARNCLIFFE.—Early part of month very cold, latter part very wet; heavy snow on 22nd. Min. 16° on 5th, 18° on 1st, and 20° on 7th.

N. SHIELDS.—Barometer and thermometer low throughout; snow on 12 days; hail on 21st and 22nd; lunar halo, 27th.

SEATHWAITE.—Early part of the month dry and frosty, with strong E. winds; last 10 days very wet and stormy, with variable winds. Rain over an inch on 5 days, over two inches on 2 days, viz., 27th=2·48, and 24th=3·30 in.

WALES.

ABERCARN.—A dry, cold month on the whole, and generally calm, excepting a heavy storm on 23rd; snow on 8 days.

HAVERFORDWEST.—March came in like a lion; snow and severe frost; thermometer as low as 18°·5 at sunrise on 1st; weather cold and gloomy, with snow every night until 13th, afterwards milder (though still very wintry) and much wetter, and at times very stormy, especially about 15th and 16th, and 23rd and 24th; the latter being the most severe storm this year. Rainfall above the average, temperature below it. The land so wet that farming operations are much retarded.

CEFNFAES.—Snow on 6th, 13th, 14th and 31st; T on 18th; S.E. gale on 23rd. Last three days very mild and spring-like, vegetation coming rapidly forward.

SCOTLAND.

DUMFRIES.—March opened with the rigour of winter; on morning of 5th, temp. down to 19°, the lowest point during the winter; after 10th the frost broke. Snow on 1st, 4th, 6th, (five or six inches deep), 13th, 15th, 20th, and 23rd. Close of month mild and showery, vegetation progressing, but snow still on the hills.

HAWICK.—Snow and frost all the first fortnight; T in afternoon of 12th.

AUCHENDRANE.—A cold dry month; grass min. below freezing on 23 nights. Max. 57° on 30th, min. 18° on 2nd. Max. barometer 30·531 on 10th; min. 28·756

on 24th. Heavy gale from S. on 23rd, but of short continuance, and not so severe as in the south of England.

OTTER HOUSE.—Although there was frost on 18 nights there was none in the day; the temperature gradually increased during the month. Daffodils are in full bloom, and the poplar nearly in leaf. [Now, April 10th, ten days after the date of the above report, more than 300 miles south of Otter House, and within the warming influence of the metropolis, no poplars yet show even leaf buds, thus showing how mild a winter residence is afforded by the Western Isles of Scotland.—ED.]

FORT WILLIAM.—Snow on 6th and 22nd. Prevailing wind N.E. until 26th, afterwards S. and S.W.

NOOKTON.—Weather variable; snow and night frosts alternating with mild spring-like weather. Min. temp. 21° on 5th; max. 58° on 29th. Snow on 1st, 6th, 7th, and 8th (with hail), daily from 19th to 23rd. Breeze at 8 p.m. on 23rd.

DEANSTON.—Snow or hail on nine days; frequent frosts; Max. 55°·9 on 29th; min. 12°·5 on 22nd.

LOGIERAIT.—A very stormy month—much snow and hard frosts till within the last week. In the last few days spring flowers and early budding trees have made much progress, but agricultural work is very far behind.

BALLATER.—A very stormy month, the fall of snow (averaging 2ft. 6in. on 7th), being greater than for at least a dozen years, while the temperature, on several occasions, was very low, falling on 5th to 3°·5, (28°·5 below freezing). There were strong N.E. gales on 3rd and 12th. During the last week the weather became much milder, and the snow melting on the hills caused the streams in the neighbourhood to be much flooded.

ABERDEEN.—More or less snow, sleet, or hail on twelve days; but on no day did the fall exceed three-quarters of an inch. Max. 60° (in sun 107°·9) on 28th. Min. 18°·5 (on grass 9°) on 5th. Max. bar. 30·363 on 10th; min. 28·909 on 24th. Aurora on thirteen nights—no severe gale.

PORTREE.—A cold wet month: agricultural operations very backward, the ground being soaked with water. No cattle disease in the island. Snow on nine days. Solar halo on 25th, at 6 p.m.—Lunar halos on 20th, 25th, and 28th. Max. temp. 54° on 28th; min. 18°·9 on 5th; on grass 15°.

LOCHBROOM.—Nothing could exceed the changeableness of the past month, but frost and snow have been its prevailing characteristics.

SANDWICK.—Wet cold month; in fact, while the previous months this winter were uncommonly mild, February and March have been severe, vegetation and agricultural operations are therefore backward. Alternate snow and thaw several days. Snow two inches deep on 19th. Aurora on 7th and 8th; lunar halo on 25th, at 10.30 p.m. Max. 54°·2; min. 25°.

IRELAND.

KILLALOE.—A cold month, ground so wet as to delay sowing oats and planting potatoes; snow on 6 days; storm from S on night of 22nd, and all day on 23rd; violent wind and rain at 6 p.m. Barometer 28·28 inches.

PORTARLINGTON.—A very severe month.

GALWAY.—Aurora on 18th.

DOO CASTLE.—Although the quantity of rain this month is less than might be expected from the number of "days," yet the land being so thoroughly saturated by the three previous months' wet, without any lengthened interval of drying, its effects are those of a very wet month; farming operations are very backward.

OWENDOON.—A very severe month, with frequent piercing winds; spring work much retarded. Great storm on 23rd; T on 26th.

WARINGSTOWN.—Earlier part of month cold and wintry; latter part so broken as seriously to impede farming operations, which are consequently very backward. Frost on grass on 20 nights. On the night of 1st, the grass thermometer fell to 12°, much lower than on any other occasion this season. Heavy gale on evening of 23rd.

LECKPATRICK.—Cold month; the great rainfall at times rendering the soil too wet for sowing. Great fall of the barometer from 9 a.m. 22nd to 10 p.m. on 23rd, during which 37 hours it fell 1·3 inch. Gale from S.W. veering to N.E. Thermometers out of order; the porcelain scales had only been fastened with plaster of Paris, and became detached by the frost.

Latitude and Longitude of the 50 Stations whence monthly returns are published.

Stations.	Latitude.	Longitude.	Stations.	Latitude.	Longitude.
Camden Town ...	51°33′ N	0° 8′ W	Dumfries	55° 5′ N	3°36′ W
Linton Park.....	51 13 N	0 31 E	Hawick	55 26 N	2 46 W
Selborne	51 6 N	0 56 W	Auchendrane Ho	55 27 N	4 37 W
Hitchen	51 57 N	0 17 W	Otter House ...	56 1 N	5 20 W
Banbury	52 4 N	1 20 W	Fort William ...	56 47 N	5 7 W
Wisbech	52 40 N	0 10 E	Nookton	56 12 N	3 0 W
Culford	52 17 N	0 42 E	Deanston	56 11 N	4 4 W
Calne.....	51 27 N	1 59 W	Logierait	56 38 N	3 41 W
Goodamoor	50 25 N	4 0 W	Ballater	57 4 N	3 5 W
Barnstaple	51 4 N	4 4 W	Aberdeen	57 9 N	2 6 W
Taunton	51 1 N	3 6 W	Culloden	57 30 N	4 7 W
Shrewsbury	52 42 N	2 46 W	Portree	57 24 N	6 13 W
Orleton	52 18 N	2 27 W	Loch Broom ...	57 47 N	5 5 W
Wigston	52 35 N	1 6 W	Helmsdale	58 7 N	3 38 W
W. Retford	53 19 N	0 58 W	Sandwick	59 3 N	3 17 W
Derby	52 55 N	1 28 W	Cork	51 54 N	8 30 W
Manchester	53 28 N	2 17 W	Waterford	52 16 N	7 6 W
York	53 58 N	1 5 W	Killaloe	52 48 N	8 26 W
Arncliffe	54 9 N	2 6 W	Portarlington ..	53 10 N	7 10 W
N. Shields	55 0 N	1 26 W	Monkstown ...	53 17 N	6 8 W
Seathwaite	54 30 N	3 12 W	Galway	53 17 N	9 3 W
Abercarn	51 39 N	3 6 W	Doo Castle	54 3 N	8 38 W
Haverfordwest ...	51 48 N	4 55 W	Owendoon	54 6 N	7 44 W
Cefnfaes.....	52 18 N	3 32 W	Waringstown ...	54 26 N	6 18 W
Llanberis	53 6 N	4 7 W	Leckpatrick ...	54 53 N	7 26 W

NOTE.—The above table has been compiled to facilitate the ready identification of the Stations, not with any pretension to rigorous accuracy; though it is hoped few of the positions are more than a mile or two in error, it is probable that some are, since few maps agree closely in the position of remote parts of the British Isles.

ON FIXING RAIN GAUGES.

HAVING noticed that the returns from one station were below all around it, I requested one of the observers in the neighbourhood to call and consult with the offending registrar as to the cause. He reported it a good gauge, but merely stuck in the hole of an old tree so loosely that any strong wind would blow it out of the perpendicular; in fact it was 15° or 20° out, when visited. The report continues:—

I fancy there may be more of your correspondents than you are aware of, who are unconscious of the absolute necessity of keeping their gauges perfectly *level* and *steady*, in order to obtain a correct account. Nor, I fancy, are they aware of the nicety required in measuring the rain in the graduated glass. For few are able to hold it perpendicular, and unless one does so I find that the difference of a hundredth at least may easily be occasioned. Then, again, an error may easily be made through not calculating by the proper surface of the water; for, owing to the attraction of the glass, the edge of the water is always nearly a hundredth higher than the centre, which is the *true level*; accordingly, in the use of the same gauge, one person may, in every registration, make the amount so much more or less than another, and no uniformity is arrived at. I find upon experiment that in Casella's gauges the calculations are made by the centre of the surface and not the edge—at least so it is in my glass measurer, and probably in all. If so, it would be well that all who use that gauge should calculate by the same rule.

RECENT PUBLICATIONS.

Meteorological Diagram, showing the daily elements throughout the year 1865. By C. O. F. CATOR, M.A. London : Stanford.

WE gladly welcome this splendid lithograph, and rejoice that Mr. Cator has produced a better diagram for 1865 than he did for 1864, since to the previous copious details he has added the weekly price of wheat ; true, this is affected by other causes as well as atmospheric fluctuations, yet none could look at this diagram without noting instantly how the rain in August sent the price up, and how rapidly it fell under the influence of the brilliant September of 1865. The mutual relations of temperature, pressure, wind, rain, mortality, &c., are most clearly shown, and we part with this handsome sheet with the suggestion that rather more prominence should be given to the barometer, and with the hope that Mr. Cator may delineate with equal accuracy the meteorology of many years to come.

A Treatise on Meteorology : the Barometer, Thermometer, Hygrometer, Rain Gauge and Ozonometer, with rules and regulations to be observed for their correct use. By ALBERT J. T. MORRIS. Edinburgh : R. Grant and Sons.

Mr. MORRIS describes his treatise as "specially adapted for the use of amateurs," and we envy those who learn their first lessons in Meteorology from his pleasantly-written pages, which are replete with information. We regret that Mr. Morris has adopted the *approximate* rule for barometer corrections given by Admiral FitzRoy in his daily Weather Reports, because we do not think observers would have found it more trouble to use a regular table, and thereby ensure correctness, and on one or two other points we should have liked stricter rules laid down ; still we have not yet seen any treatise on Meteorology so suitable for an amateur observer as Mr. Morris's.

Annual Report of the Royal National Lifeboat Institution. Published at the Office, John Street, Adelphi.

THOUGH not strictly Meteorological, the publications of this Society (especially their quarterly journal, "The Lifeboat") so frequently contain communications on Meteorology that that reason is superadded to the universal desire of helping forward their noble work in inducing us to wish them all success. It is very gratifying to see that though their expenses last year were nearly £30,000, their receipts were even larger : long may the balance continue on that side ; but that such may be the case *all* must remember (what treasurers of societies never forget) that an ample supply of new subscribers must be enlisted each year to take the place of those annually removed by death.

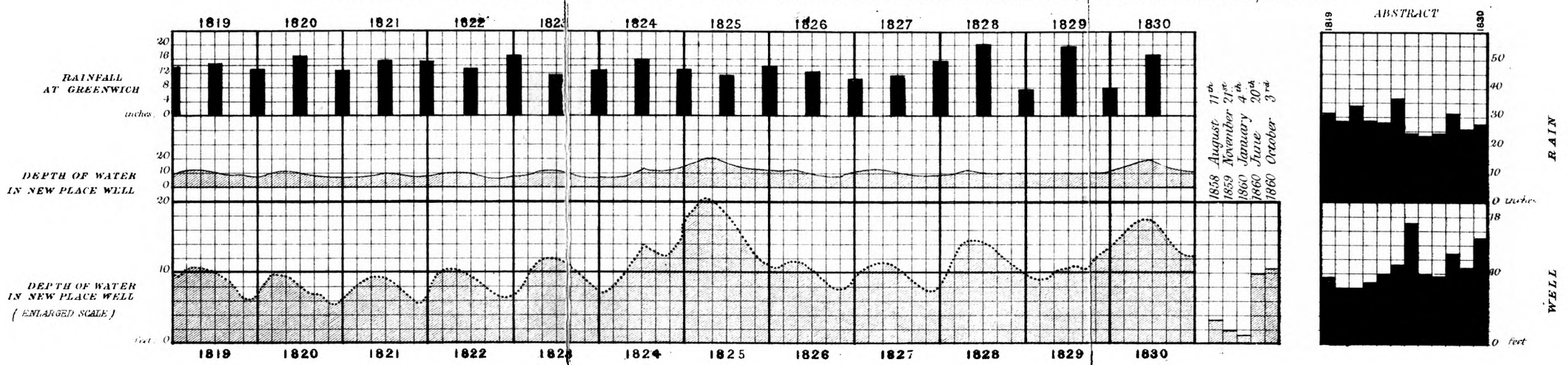
Proceedings of Literary and Philosophical Society of Manchester, Vol. 5, *No.* 12, contains a most interesting analysis by Mr. Baxendell of the first 8 months' records of Rev. J. C. Bates's quarter-hourly self-registering rain-gauge. Owing to the short period during which the instrument has been at work, there is little doubt that the results will require subsequent modification ; but with this introductory remark, and looking to the interest attending this first determination of the relative rainfall in different hours of the day, we annex with pleasure the results Mr. Baxendell has deduced :—

Daily Rainfall.		Oscillations of Magnetic Needle.*
Principal maximum	at 8½ a.m.	10 a.m.
Secondary ,,	8 p.m.	7½ p.m.
Principal minimum	2 p.m.	1 p.m.
Secondary ,,	1½ a.m.	3 a.m.

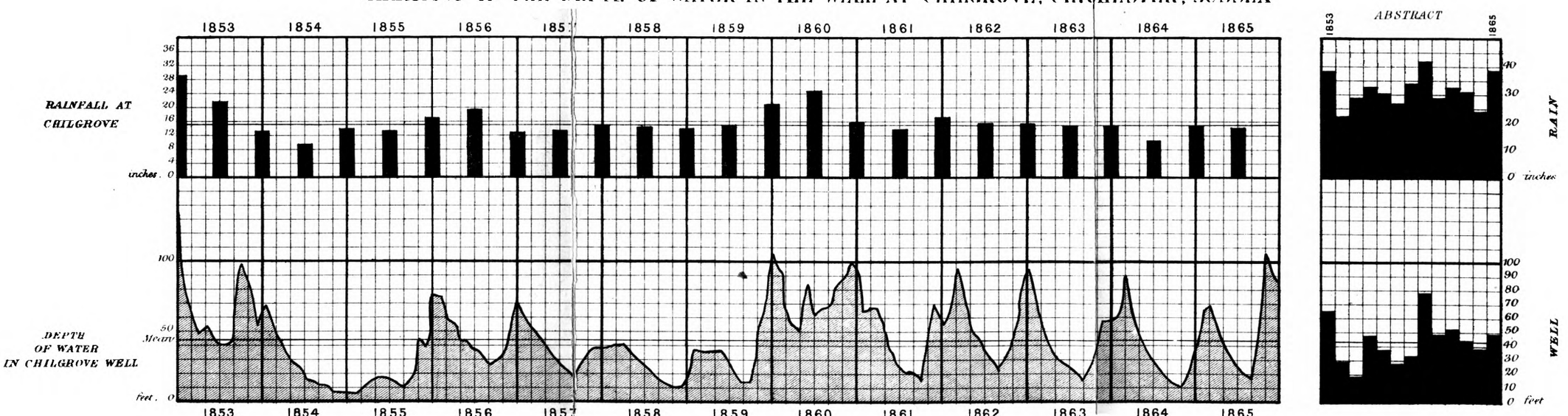
* Mean of ten years' declination at Greenwich, westerly deviation being taken with a negative sign.

In addition to the similarity in the daily curves of rainfall and magnetic oscillations noted above, we may mention, as Mr. Baxendell has done, the similarity which the former presents to the barometric curve, save that the rainfall max. and min. precede the barometric by about two hours.

VARIATION IN THE DEPTH OF WATER IN THE WELL AT NEW PLACE, HARTLIP, SITTINGBOURNE, KENT.



VARIATION IN THE DEPTH OF WATER IN THE WELL AT CHILGROVE, CHICHESTER, SUSSEX



In the above curves the black line separating each year is held to represent January, each succeeding line and space the several months: the rain blocks show the total fall during the six summer and six winter months, and are therefore placed on the lines of January and July

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

IV.] MAY, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

WELLS, VARIATIONS IN THEIR DEPTH.

WE are very glad to receive in speedy response to the article in last month's Magazine two very complete sets of well measurements. Some of the prominent features we purpose to notice on the present occasion, and, to make our remarks still more clear, have laid the results down on the accompanying diagram. In the first place, it should be stated that for the Hartlip observations we are indebted to Mr. Bland, of New Place, and for those from Chilgrove, to Mr. Leyland Woods.

The first feature that demands attention is the excessive fluctuation in the depth at Chilgrove as compared with that at Hartlip; that at the former being *nine times as great* as that at Hartlip.

The month of least water at Chilgrove is September, at Hartlip it is December; and a still stronger contrast exists with reference to the month of fullest supply, which is November at Chilgrove, and June at Hartlip, the probable, if we may not say evident, cause, being the rapidity with which the chalk downs absorb the rain falling on them. Indications of this may be noted in almost every year of the Chilgrove observations, but the most striking illustration occurred at the close of the summer drought of 1865. This, it will be remembered, ended on October 8th; rain fell most heavily from the 19th to the end of the month, amounting altogether to 10 inches, or 2 inches more than in any other month in the 13 years. The well on October 8th contained less than 19 feet of water, on 26th it had 24 feet, on November 2nd 66 feet, and by the end of that month 105 feet. A moment's glance at the Hartlip curve will show that no such fluctuations occur there.

It has, we believe, been laid down that summer rains are of little moment to the hydraulic engineer; it does not become us lightly to controvert the dicta of practical men, yet some points do appear worth mentioning. And, first, Chilgrove; the rainfall in the winter 1855-56, and the winter of 1861-62, were nearly equal, the summer of the former year had about 19 inches, and the latter 15. At the commencement of the summer half 1856 the well had 54 feet, and at its close 30 feet—*decrease* 24 feet; in 1862 it started with 82 feet, and had only 30 feet left, the *decrease* being 52 feet, or twice as great as with the wetter summer of 1856. Again, the winter of 1852-53 was considerably wetter than the winter of 1859-60, but the summers were the reverse. The *very* wet winter 1852-3, and wet summer of 1853 did not produce so much water by one-seventh as the wet winter 1859-60, and *very* wet summer of 1860. At Hartlip there seems even a stronger proof that summer falls are not to be ignored. The winters of 1828-29

and 1829-30 were remarkably dry, and the summers as noticeably wet —but as is immediately seen from the diagram, the loss of nearly half the usual winter supply was insensible, being, we suppose, fully made up by summer falls, and the well was rather fuller than usual.

Of course, we by no means ignore the normal dependence of *all* sources of water-supply on the rainfall of the colder months, but it appears that the summer rain must also be carefully watched. It occurs to us—and we give the suggestion for what it is worth, and no more—that possibly the elevation of water (even from great depths) by natural capillary action may far exceed in amount anything of which we have any idea; if so, then we at once see why wet summers are so beneficial to the supply of well-water, for they not only add a little to the winter's stores, but also prevent

DEPTH OF WATER IN WELL AT NEW PLACE, HARTLIP, SITTINGBOURNE.

YEAR.	1819.		1820.		1821.		1822.		1823.		1824.		1825.		1826.		1827.		1828.		1829.		1830.		Mean	
	ft.	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	ft.	in	ft.	in	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
Jan. ...	10	0	6	7	6	3	6	10	7	3	7	0	17	3	10	6	9	6	8	4	9	8	13	10	9	5
Feb. ...	9	9	8	0	7	6	9	1	7	10	7	6	19	0	11	0	9	10	11	7	9	4	14	6	10	5
March	10	0	9	6	8	3	9	11	9	5	8	3	20	0	11	3	10	1	13	4	9	1	15	9	11	3
April .	10	9	9	6	8	9	10	1	10	9	9	0	20	4	11	6	11	0	14	3	9	3	16	7	11	11
May ...	10	9	9	0	9	0	10	2	11	9	10	0	20	0	11	6	11	3	14	6	9	6	17	2	12	1
June...	10	6	8	10	9	6	10	0	12	0	12	2	19	6	11	4	11	2	14	6	10	7	17	4	12	3
July ...	10	0	8	3	9	3	9	9	12	0	14	0	18	0	10	9	10	6	14	2	10	10	16	10	12	0
Aug....	9	6	7	4	8	6	8	8	11	9	13	6	16	6	9	10	9	8	13	7	10	9	16	0	11	4
Sept...	8	6	7	0	7	10	7	10	10	9	13	0	15	8	8	10	8	8	12	7	10	4	14	11	10	6
Oct. ...	8	0	6	6	6	10	7	3	10	0	12	6	14	0	7	9	8	1	12	0	10	10	13	9	9	10
Nov....	7	0	5	10	6	3	6	10	8	9	13	0	13	0	7	9	7	6	11	0	12	3	12	10	9	4
Dec. ...	6	6	5	10	5	10	6	6	8	0	14	3	11	6	8	2	7	5	10	2	13	2	12	5	9	2
MEAN.	9	3	7	8	7	10	8	7	10	1	11	2	17	1	10	0	9	7	12	6	10	6	15	2	10	10

Brim 157 feet 9 inches above sea ; well sunk through plastic clay and chalk. Depth to water, 130 ft.; mean depth of water, 10 ft 10 in. ; greatest observed depth in April, 1825, 20 ft. 4 in. ; least (in November and December, 1820), 5 ft. 10 in. ; variation, 14 ft. 6 in. Recent measurements give for the minimum, 1 ft. in January, 1860, during which wet year it rose to 11 ft. 6 in. by October, or 1 foot above the average of the above period.

RAINFALL AT GREENWICH OBSERVATORY. Height above Ground, 6in. Above Mean Sea Level, 155ft.

YEAR	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	Mean
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Jan. ...	2·3	1·9	2·4	·6	1·5	1·0	1·1	·3	1·2	4·3	·4	1·7	1·56
Feb. ...	3·0	·6	·0	1·1	3·5	2·5	1·0	1·9	·7	1·1	1·3	2·5	1·60
March.	1·8	1·5	3·9	1·5	1·5	1·9	1·4	1·9	2·6	1·0	·7	·3	1·67
April..	3·1	1·6	2·0	2·9	2·0	2·1	2·0	1·1	1·3	2·4	4·8	3·2	2·38
May ...	3·3	4·0	2·4	2·1	·8	4·2	3·3	2·7	2·6	1·7	·6	2·2	2·49
June...	2·5	2·3	2·4	·9	1·2	3·8	·8	1·1	·7	2·2	1·7	2·6	1·85
July ...	2·2	4·8	3·1	4·5	3·6	2·0	·1	2·6	1·4	7·0	4·2	1·9	3·12
Aug....	·4	1·9	2·1	2·0	3·0	4·4	2·7	1·9	1·2	4·2	4·5	3·9	2·68
Sept...	3·4	2·4	3·7	1·5	1·0	3·5	2·8	3·4	3·9	2·6	3·6	3·5	2·94
Oct. ...	2·3	2·9	2·6	4·0	4·4	2·6	3·0	1·9	4·4	1·5	1·9	·8	2·69
Nov....	3·0	2·0	4·7	4·1	1·8	4·3	3·2	2·8	1·3	1·0	1·4	3·4	2·75
Dec. ...	3·8	1·8	5·2	2·5	2·8	4·0	3·2	1·4	3·6	2·5	·1	1·2	2·67
TOTAL	31·1	27·7	34·5	27·7	27·1	36·3	24·6	23·0	24·9	31·5	25·2	27·2	28·40

the constant drain of evaporation from the surface of the ground; and, if our theory be worth anything, not *only* from the surface but also from the uniformly moist ground beneath, down, we know not how far.

It will be seen that the depth of water at Hartlip is shown twice, once on the same scale as that at Chilgrove, for comparison therewith, and once on a more open scale, to show the monthly variations. The isolated observations in 1858-59-60 are very interesting, as showing how slight (if any) is the permanent lowering of the water at that place.

The abstracts are mainly interesting as indicating that, from our rainfall observations when fully analyzed, we may hope to determine the amount of water stored in the earth at any date for nearly 200 years, and even the level at which it would stand.

DEPTH OF WATER IN WELL AT CHILGROVE, CHICHESTER.

Well situated in a valley of the Chalk Hills—brim about 266 feet above Sea Level, the hills on three sides rise from 200 to 500 feet above it.

YEAR.	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	Mean 13 yr.
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Jan. ...	135	65	×	76	71	38	11	107	93	57	95	59	32	65
Feb. ...	80	60	×	75	59	39	36	91	65	61	81	62	67	60
March.	60	48	11	56	51	40	36	60	66	96	59	90	69	57
April	50	38	15	54	47	40	35	53	66	82	43	59	50	49
May...	52	30	18	44	40	35	35	50	50	60	33	46	38	41
June...	43	24	18	41	32	31	36	83	37	48	30	35	31	38
July...	40	18	16	39	26	25	25	64	29	38	27	30	25	31
Aug. ..	40	15	13	31	21	21	20	65	24	31	23	23	20	27
Sept..	49	14	11	26	17	17	15	65	21	25	19	16	19	24
Oct. ...	98	13	19	30	25	13	14	84	18	30	23	14	45	33
Nov....	84	×	44	31	33	11	38	85	40	42	37	12	105	78
Dec. ...	54	×	39	62	38	10	76	100	70	65	59	16	91	53
Mean..	65	28	18	47	38	27	31	76	48	53	44	39	49	43

NOTE.—Previous to February, 1855, the well was only 135 ft. deep, subsequently it was 145 ft., the 10 ft. has been added to the first two years' measurements, so as to secure uniformity; there was no water at 135 ft. in the four months × × × ×, but it probably was considerably above the base line of 145 ft. In taking the means 8 ft. has been assumed for each of those months. Mean depth of water 43 ft., greatest observed depth (in Jan., 1853) 135 ft., least (in the winter of 1855) 8 ft? variation 127 ft. In Jan., 1866, it rose to 143 ft., which would raise the variation to 135 ft.

RAINFALL AT CHILGROVE. Height above Ground, 6in. Above Mean Sea Level, 284 ft.

YEAR.	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	Mean
Jan. ...	5·00	3·17	·70	4·05	2·98	1·65	2·44	4·34	·78	3·21	3·95	2·06	4·35	2·98
Feb. ...	1·10	·80	1·50	1·35	·43	1·03	2·21	1·50	2·08	·75	·94	1·48	2·60	1·37
March.	2·07	·42	2·95	1·25	2·20	1·66	1·88	2·18	2·96	3·99	1·21	3·39	1·26	2·11
April .	3·45	·16	·45	3·86	2·11	2·67	3·27	1·75	·76	1·13	·57	1·48	·43	1·70
May ...	2·25	3·92	2·95	3·83	1·35	2·40	1·23	3·85	1·55	3·55	2·35	1·60	2·89	2·59
June ..	2·49	1·90	1·30	2·21	2·30	·99	1·30	6·72	2·34	2·60	4·52	1·33	2·27	2·48
July ...	6·47	·85	4·50	·79	1·51	2·95	3·08	2·88	4·81	2·74	·89	·38	2·44	2·64
Aug....	3·46	1·35	1·32	4·29	2·42	2·57	1·74	5·05	·73	2·39	1·99	1·04	5·49	2·60
Sept...	3·61	1·20	2·70	4·20	4·72	2·56	4·35	3·86	3·94	2·24	4·20	4·26	·30	3·24
Oct. ...	5·97	4·02	7·20	3·22	7·83	2·20	4·15	2·86	1·81	5·17	4·33	1·88	9·95	4·66
Nov...	1·60	1·85	1·70	1·04	2·08	1·75	5·04	3·60	4·99	1·45	2·24	4·35	3·50	2·70
Dec. ...	·65	2·17	1·69	2·88	1·31	3·43	3·57	3·41	1·92	3·13	3·26	1·42	2·97	2·45
TOTAL.	38·12	21·81	28·96	32·97	31·24	25·86	34·26	42·00	28·67	32·35	30·45	24·67	38·45	31·52

RAINFALL IN APRIL, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground ft.	in.	Above Sea Level. feet.	Depth of Rain. Total Fall. inches.	Difference from average 1860–5 inches.	Greatest Fall in 24 hours. Depth. inches.	Date.	Days on which ·01 or more fell.
I.	ENGLAND.	Camden Town	0	6	100	1·76	+ ·63	·74	28	13
II.		Staplehurst (Linton Park)	0	6	200 ?	2·09	+ ·87	·53	29	16
,,		Selborne (The Wakes)	4	0	500 ?	2·78	+1·28	·49	28	15
III.		Hitchen	2	0	240	1·65	+ ·65	·76	29	14
,,		Banbury	7	0	345	1·52	+ ·36	·75	28	14
,,		Wisbech	0	6	10	1·69	...	·57	28	9
IV.		Bury St. Edmunds (Culford)	1	2	...	1·85	+1·10	·46	28	12
V.		Calne	0	11	250	2·17	...	·67	28	19
,,		Plymouth (Goodamoor)	0	2	580	2·98	+ ·73	·56	11	15
,,		Barnstaple	0	6	31	1·46	— ·55	·35	12	13
,,		Taunton (Fulland's School)	1	4	...	1·91	+ ·37	·53	29	13
VI.		Shrewsbury (Highfield)	5	6	200	·68	— ·66	·24	12	9
,,		Tenbury (Orleton)	0	9	200	1·69	+ ·15	·35	12	18
VII.		Leicester (Wigston)	0	6	220	1·31	+ ·01	·25	6	13
,,		West Retford	0	6	50	1·27	+ ·26	·27	2	13
,,		Derby	5	0	180	1·04	— ·39	·43	1	14
VIII.		Manchester	2	7	106	·30	—1·46	·08	20 & 27	6
IX.		York	0	6	50	1·05	— ·05	·33	3	11
,,		Skipton (Arncliffe)	3	0	750	2·01	—1·03	·43	1	12
X.		North Shields	1	0	124	1·47	+ ·16	·31	1	13
,,		Borrowdale (Seathwaite)	1	0	422	5·97	— ·93	1·18	16	15
XI.	WALES.	Abercarn	1	3	450	3·30	...	·84	28	17
,,		Haverfordwest	2	0	60	2·21	+ ·35	·64	28	10
,,		Rhayader (Cefnfaes)	2	0	880	1·33	+ ·56	·30	28	15
,,		Llanberis (R. Victoria Hotel)	1	0	370	5·42	...	2·92	2	13
XII.	SCOTLAND.	Dumfries	0	5	70	·96	— ·71	·21	19	12
,,		Hawick (Silverbut Hall)	4	0	512	2·22	...	·54	2	17
XIV.		Ayr (Auchendrane House)	2	3	94	·77	—1·46	·22	15	10
XV.		Otter House	0	6	130	2·30	— ·45	·55	20	11
XVI.		Leven (Nookton)	0	6	80	1·45	+ ·20	·34	19	13
,,		Stirling (Deanston)	0	0	130	2·11	+ ·36	·86	16	14
,,		Logierait	1	0	250	1·49	...	·34	16	11
XVII.		Ballater	0	10	656	2·06	...	·48	1	18
,,		Aberdeen	4	8	115	1·62	...	·63	19	16
XVIII		Inverness (Culloden)	3	0	104	1·01	...	.41	2	9
,,		Fort William	0	8	20	3·79	...	1·32	16	14
,,		Portree	0	4	60	3·80	—1·47	1·02	19	12
,,		Loch Broom	0	8	48	2·59	...	·40	1	16
XIX.		Helmsdale	1	0	34	1·49	...	·46	28	19
,,		Sandwick	2	0	78	1·21	— ·53	·38	20	13
XX.	IRELAND.	Cork	6	0	65	3·62	...	1·19	26	21
,,		Waterford	4	0	60	2·41	+ ·18	·54	26	19
,,		Killaloe	5	0	128	2·05	— ·08	·40	13	16
XXI.		Portarlington	9	0	236	1·64	— ·38	·31	5	20
,,		Monkstown	0	6	100	2·11	+ ·47	·52	4	17
XXII.		Galway	6	0	25	2·22	...	·46	15	18
,,		Bunninadden (Doo Castle)	1	0	...	1·65	...	·29	18	15
XXIII		Bawnboy (Owendoon)	1	3	218 ?	2·24	...	·36	18	20
,,		Waringstown	0	4	191	·98	...	·16	11	13
,,		Strabane (Leckpatrick)	0	5	260	1·26	...	·33	18	14

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Hail at 0.20 p.m. on 14th; lunar halo on 27th; currant in blossom on 19th; cherry on 25th; chesnut in leaf on 23rd; vine on 24th; first butterfly on 25th. Max. 79°·4; in sun, 120°·3 on 27th; min. 33°·8 on 30th.

LINTON PARK.—First fortnight wet; the latter fine, with the exception of the 29th. The whole month mild, there being frost only on two mornings, while on the 27th the thermometer was 80° in shade. L on 7th, 10th, 11th, and 14th. Vegetation advanced rapidly between the 20th and 29th, but the ground very cold and bad for tillage. Cuckoo heard on the 11th; some say one day sooner, which is earlier than usual.

SELBORNE.—Rapid change of temp. from 26th to 30th. Hailstorms on 4th, 14th, and 20th. Aurora on 2nd and 5th. Max. temp. 65°·5 on 27th; min. 27°·5 on 5th. Cuckoo first heard on 12th; nightingale on 17th; swallows seen on 15th.

BANBURY.—Hail on 5th and 29th; aurora, 11th. Max. temp. 75° on 27th; min. 28° on 30th. Cuckoo on 20th; swallows on 13th; apple in bloom on 27th.

WISBECH.—Max. 77°·4 on 27th; min. 32° on 30th. Hail on 5th and 30th; L on 2nd and 14th. Swallow on 13th; pear in bloom on 22nd; apple on 25th; field elm in leaf, 21st; wych elm, 23rd; lime, 25th; sycamore, 26th; walnut, 28th.

CULFORD.—First half of month showery, second, fine. 26th, 27th, and 28th unusually warm, the max. being respectively 70°, 76°, and 68°, while the 29th and 30th were cold, the wind being east, and max. only 51° and 48° respectively.

GOODAMOOR.—Max. temp 66°; min. 28° on 30th. Strong E. wind on 23rd, doing much damage to trees and buildings. Cuckoo heard and swallows seen on 16th; swift seen on 26th. L on 6th.

ORLETON.—Temp. very variable, but above the average. Max. 71°·5 on 27th; min. 30° on 30th. Grass min. below 32° only on 3 nights. On 28th, a sudden change from heat to cold. Cuckoo heard on 19th; first swallow seen on 13th; white-throat and willow wren on 21st. A few flakes of snow on 30th.

WIGSTON.—Season rather more forward than usual, as shown by the hawthorn and deciduous trees, and the unusually early appearance of the swallow, and sound of the cuckoo. Max. temp. 81°·5 on 27th; higher than I have ever known in April. Min. 26° on the 29th.

WEST RETFORD.—T and L on 14th; slight snow on 30th. With a few exceptional days, this has been a dull, cold month, the wind having been chiefly E., N.E., and N. Max. temp. 74° on 27th; min. 23° on 30th. Vegetation very backward, owing to the generally cold weather, and insufficient rainfall.

MANCHESTER.—The unusually small rainfall of April has, no doubt, been caused by the great prevalence of north-east winds, the black bulb in vacuum recorded 126°·8 on the 27th, a very high reading for April.

ARNCLIFFE.—Rainfall considerably below the average. A long prevalence of E. winds, and a backward spring. Max. temp. 64° on the 27th; min. 25° on 4th.

NORTH SHIELDS.—Hail on 1st, 14th, and 29th. Snow on 1st, 2nd, 3rd, and 30th. White rock cress in flower on 1st; Jerusalem cowslip on 8th.

SEATHWAITE.—More than 1 in. of rain on 2 days. East winds, with excessive hygroscopic dryness. At Tarnbank on 26th, at 3 p.m., dry bulb, 71°·0; wet bulb, 56°·2: diff. 14°·8. Evap. in 24 hours = ·410 in. On morning of 30th, min. at 4 feet, 26°·9 and on grass 16°·4.

WALES.

ABERCARN.—The month has been generally dry, but cold; the alternations of temp. being sudden and frequent.

HAVERFORDWEST.—On the whole, a fine month; air generally cold, but with frost only on the 3rd, 29th, and 30th. Vegetation forward; the dry weather from the 16th to the 27th enabled the farmers to complete their sowing, which had been much retarded by the wet, and late cold of the winter. There was much high wind, but no heavy gale. A warm period occurred about the 26th and 27th, followed by a sudden fall of temp. to the end of the month. Max. 70°·5; min. 29°. A splendid meteor about 4 a.m. on the 12th; it appeared like a ball of white luminous matter, and burst into a series of stars like a sky-rocket, and disappeared.

CEFNFAES.—A dry April; parching winds from the N.E. prevailing during the month; and, at the end, all springs and sources of water very low. Cuckoo heard on the 16th, and corncrake on 29th. Max. 65°; min. 27°.

SCOTLAND.

DUMFRIES.—Showers on the 1st and 2nd; thence to the 10th, frosts at night, and cold, withering east winds by day. The next week mild and showery, vegetation making much progress. From the 20th to the close, weather dry, except on the 27th. Sowing completed under favourable circumstances in the beginning of the month, the oat and barley brairds looking fresh and vigorous, but the dry and frosty weather towards the close of the month checked the growth of the grass. On 30th, the fruit-trees in blossom (especially pears and plums) were much injured by the frost. Cuckoo heard on the 19th. On the last of the month the *winter* snows had not disappeared from the hollows of the Wamphray hills. Max. 75°·5 on 27th; min. 28° on 4th; T on 27th.

HAWICK.—Snow on the 1st, 2nd, and 30th. Swallows first seen on 29th. First half of month very cold, wet, and windy, and agricultural operations almost at a stand-still; the latter half fine, except the last two days.

AUCHENDRANE.—Rainfall in April, 1861 = ·61; in 1865 = ·67; 1866 = ·77; min. below 32° on 7 nights, on grass on 15 nights. The early potatoes, and plum tree blossoms, injured by the frosts of the 29th and 30th. On 26th, max. in sun 101°, in shade 69°; humidity at 2.45 p.m. only 35°; evap. from a water surface, 5 inches in diameter, amounted to ·25 in 24 hours.

OTTER HOUSE.—Rain more or less from the 11th to the 21st—none before or after. TS on 19th. Frost on 3rd, 5th, 29th, and 30th. Weather favourable for agricultural operations, though rain is rather wanted. The cuckoo's welcome note was *heard* on 26th, and they are generally seen a fortnight before they are heard.

FORT WILLIAM.—N.E. winds from the 1st to the 11th, then S.W. to 15th, when it blew a gale; and N.E. again at the end of the month.

NOOKTON.—Cold and ungenial. Min. 27°·4 on 30th.

DEANSTON.—T on 13th and 14th. *Very dry* and sunshiny from 23rd to 26th. Cold, with hard frost on the 29th and 30th, min. on grass 24° and 21° respectively. Max. in shade 64°·5 on 26th, min. 25° on 4th.

LOGIERAIT.—Cold E. winds throughout the month. From the 20th, onwards, there has been great warmth and sunshine during the days, but frost and cold E. wind during the nights; the rainfall was confined to the 10th to 19th, there being only two other days (the 26th and 30th) on which any fell, and that of the 30th was only ·01, and chiefly from snow.

BALLATER.—Temp. very changeable, ranging from 20°·5 on 1st, and 22°·5 on 30th to 71°·7 on 27th; the week preceding the 27th remarkably fine, but the month closed very stormy and cold. Ice $\frac{3}{8}$-of-an-inch thick on water on the 30th. Four rainbows were observed, a magnificent double one on the 13th, not rising higher than the hill tops at 2 p.m.; several peals of thunder were heard on that day.

ABERDEEN.—Hail on 2nd to 5th, 17th, 19th, 28th, and 29th; fog on 10th, 11th, 12th, 25th, 26th, and 27th. Max. 75°·3 on 25th; min. 29°·5 on 30th; 21° on grass. A cold, raw month, but very quiet—no gale.

PORTREE.—The month, on the whole, has been cold, although the amount of sunshine has been above the average. Mean. temp. of month, 46°·1. Min. in shade 25°·4; on grass 15°·8 on 29th. No gales during the month, but very squally from the 13th to 16th, with heavy hail showers. Max. in shade 67°·0 on 25th and 26th. Cattle and sheep very weak from the heavy rains of the first three months of the year, but otherwise healthy.

LOCHBROOM.—The month, on the whole, has been a cold, dry one; the spring unfolding slowly, but gradually, until the 22nd, when the most beautiful weather burst upon us all at once till the 27th, when a most sudden and unwelcome change took place. Snow, intense cold, and hail as large as grape shot became the order of the day to the end of the month.

HELMSDALE.—Since the 26th the weather very cold. Snow, 4½ inches deep, fell on the morning of the 29th.

SANDWICK.—The month has been dry and cold; temp. 1°·4 below the mean. Ground sprinkled with snow on 2nd, 29th, and 30th; two peals of thunder on 13th; aurora on 5 nights; the prevalent direction of the wind was evidently the cause of the cold and dryness, it being N.N.E. and S.E. 19½ days.

IRELAND.

MONKSTOWN.—Gale on the 2nd; severe one on 16th; the first part of the month rather wet, rain having fallen almost every day, though only in small quantities. In the middle of the month the temp. was high, but the last few days were bitterly cold and harsh. Snow on the 29th, which continued lying on the mountains. Prevailing wind, easterly; it having ranged from N.E. to S.E. on 21 days; frost on the grass on several nights; temp. below 32° on 6 nights. Min. 27° on 4th; max. 66° on 21st. Vegetation fairly forward; gooseberries, currants, and wall-fruit in most cases being well formed.

DOO CASTLE.—T on 30th. No growth of any consequence this month; farming operations in a very backward state; cold N.E. winds for the last eight days, destructive of all growth.

OWENDOON.—Hail on 1st and 30th; 2 in. of snow on 2nd, rather wet till 19th, then fine to 27th; cold to the close. Vegetation and spring work very backward. Swallows on 14th, cuckoo on 18th.

WARINGSTOWN.—Cold and ungenial, with easterly winds till the 12th; stormy and unsettled to 18th; then 10 days of fine seasonable weather, followed by two intensely cold days, and a most damaging frost on the night of the 29th, on which the min. was 26°. Frost on grass on 8 nights.

LECKPATRICK.—Very dry month; cold, parching easterly winds being prevalent. The rainfall less than in any April for 5 years; but, owing to the great fall during the previous months, the total fall for this portion of the year exceeds that of any previous one during that period—1862 = 14·01; 1863 = 10·04; 1864 = 10·69; 1865 = 13·23, and this year = 15·33.

GALE OF FEBRUARY 11TH, 1866.

Want of space prevented that earlier special notice of this gale which its local violence fully required. At all English stations, and the two Irish ones quoted herein, the lowest reading of the barometer in the month was on the 11th; and, therefore, the following readings are not only the minima of the gale, but also of the month.

BAROMETER REDUCED TO SEA LEVEL ON FEBRUARY 11TH.

STATION.	COUNTY.	Bar. at 9 a.m.	Lowest Reading and hour of occurrence.	Decrease.
		inches.	inches.	inch.
Waterford	Waterford		28·91	
Dublin	Dublin		28·89	
Kendal	Westmoreland		28·97	
N. Shields	Northumberland		28·82	
York	York		28·80	
Pentyrch, Cardiff	Glamorgan	28·85	28·55 at 5 p.m.	·30 (*a*)
Llanfrechfa, Newport	Monmouth	28·93	28·52 at 3 p.m.	·41
Boyce Court, Dymock	Gloucester		28·12 at 3 p.m.	(*b*)
Belgrave, Sidmouth	Devonshire		28·58 at 1 p.m.	
Holford, Bridgewater	Somerset		28·70	(*c*)
Bath	,,		28·50	
Banbury	Oxford		28·48 at 5 p.m.	
Ryde, Isle of Wight	Hampshire	29·06	28·73 at 2 p.m.	·33
Reading	Berkshire		28·48	(*d*)
Eton	Buckinghamshire	29·16	28·61 at 5 p.m.	·55
Betchworth	Surrey		28·62	
Camden Town	Middlesex	29·25	28·61 at 4½ p.m.	·64 (*e*)
Dover	Kent		29·10	
Sudbury	Suffolk		28·54	
Wisbech	Cambridge		28·71	
Mattishall, E. Dereham	Norfolk		28·54in afternn.	

(*a*) Bar. never so low before. No gale here.—(*b*) Not reduced to Sea Level. The calmest day this year.—(*c*) Gale from S. to N.W.—(*d*) Terrific gale.—(*e*) Heavy gale all the afternoon, with rain.

REMARKS.—*Ryde.*—On the 11th, a violent storm commenced about 4 a.m.; wind, S.S.W.; from 12 to 3, wind W.S.W., and blowing a complete hurricane. From 2 to 3 it raged with great fury. Large trees were blown down in all parts of the island, to the number of above 800; stacks of chimneys, tiles, slates, lead and zinc roofing torn away like paper, and many other damages. Two or three vessels at the Motherbank broke from their anchors, and one drifted on the Woolsiness, and was lost, with all hands. It is now thirty years since Ryde was visited with such a terrible hurricane, and that occurred on the 29th Nov., 1836. *Camden Town.*—Lowest barometer for at least 10 years; next lowest, 1859, December 26th, 6 a.m., 28·629 inches. *Mattishall.*—Lowest reading for 4 years, and though windy and wet, the weather was by no means commensurate with such an extraordinary depression.

The gale was very violent and destructive at Truro, Falmouth, Penzance, St. Ives, Poole, Portsmouth, Selborne, London, Chatham, and Yarmouth (Norfolk). Less violent, but still a high wind at Goodamoor, Calne, Taunton, W. Retford; did not reach the Northern Counties, Scotland, or Ireland, at all.

At Rouen the gale was very violent, and blew a train of empty carriages over the blocks, and on to the main-line, on which a train from Paris met and smashed eight of them. At Antwerp (as in several parts of England) the gale was accompanied by a heavy thunderstorm, and the waters of the Scheldt became so rough that two vessels were wrecked.

The Board of Trade reported—"The gales of Saturday night, 10th, and Sunday, 11th, were of unusual violence, and appear to have been most severely felt on our southern coasts. The disturbance seems to have partaken, in some degree, of a cyclonic character. It seems probable that the area of least pressure, or centre of the storm, passed in an easterly direction, not very far to the northward of London."

It will at once be seen that the above minima, although remarkably low for the south of England, are greatly above those given by Mr. Cunningham *(Met. Mag. p. 16)* for the Scottish stations on December 31st, 1865. The path of the storm seems to have been somewhat similar to that of the Royal Charter storm, with less N. in its direction, and rather to the S. of that celebrated track.

ARRIVAL OF BIRDS.

From the reports on pages 31 to 33, and others, we find the dates to have been—

Cuckoo—11th at Linton Park; 12th at Selborne; 14th at Hillington, Lynn (Norfolk); 16th at Goodamoor and Rhayader; 18th at Owendoon; 19th at Killingholme, Ulceby, (Lincoln,) Orleton, and Dumfries; 20th at Banbury; 21st at Halifax; and 26th at Otter House.

Swallows on 13th at Orleton and Wisbech; 14th at Killingholme and Owendoon: 15th at Selborne; 16th at Goodamoor; 19th at Dublin; 29th at Hawick.

EQUIVALENT EXPRESSIONS OF WIND FORCE.

It has been suggested as desirable that the terms originally coupled with the sea scale 0—12 should be given. They are—

0 Calm.	3 Gentle Breeze.	6 Strong Breeze.	9 Strong Gale.
1 Light Air.	4 Moderate Breeze.	7 Moderate Gale.	10 Whole Gale.
2 Light Breeze.	5 Fresh Breeze.	8 Fresh Gale.	11 Storm.
			12 Hurricane.

LATEST INTELLIGENCE.

DUMFRIES.—On night of May 1st, a heavy fall of snow on the hills, being very deep on the mountain ranges round Moffat.

HELMSDALE.—Snow on May 1st, very trying for the lambs.

DUBLIN.—May 1st, a heavy fall of snow, and hail on 2nd.

The Cleveland hills, the moors, and the highest wolds in Yorkshire were covered with snow on the 1st, 2nd, and 3rd.

At Barton Seagrave, near Kettering, the min. in air on the 4th, was 23°·2. At Camden Town the air temperature did not fall below freezing point, but the grass temp. fell to 25°·5.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

V.] JUNE, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

BLACK RAIN.*

PERSEVERANCE is said to command success; if so, unless an early protest be raised, we may soon find a popular belief in frequent falls of volcanic matter in different parts of the British Isles. While we accept most of Mr. Rust's facts, we dispute *in toto* his deductions; but that our readers may fairly understand the case, Mr. Rust shall speak—first, by the reproduction of a paragraph recently quoted by the *Times* from the *Aberdeen Journal*; secondly, by extracts from the work above quoted. On both we will then briefly comment.

BLACK RAIN.—The black rain showers, which are now so well known in Scotland, and about which the inhabitants of a part of Aberdeenshire are in the way of speaking with no greater astonishment, when one of them falls from a peculiarly-coloured dark cloud, blackening materials exposed to it, than they speak of a white shower from a snowy cloud, have been at last recognized in England. Between the beginning of January, 1862, and the middle of January, 1866, there have been no fewer than eight authenticated black showers in Scotland. Seven of these fell in Slains and the extensive surrounding district. Two of them were accompanied with pumice stones, some of the balls of which measured 8 to 10 inches in diameter, and weighed upwards of a pound avoirdupois. The first four, including the Carluke shower, and the eighth, were contemporaneous with outbursts of Vesuvius, and the intermediate three with those of Etna. But now through the instrumentality of the Rev. Mr. Rust, of Slains, who was the first to draw general attention to the Scottish showers, it has been discovered that England gets her share likewise of black showers, although she did not think that she was so distinguished. On the 3rd of May of the present year (1866), at 11 a.m., and again at 4 p.m., the town of Birmingham and the surrounding country were for three-quarters of an hour each time enveloped with black clouds producing darkness and rain. Accidents took place in the streets, vehicles were upset, and gas had to be lighted at some of the crossings, and nearly in all places of business. Mr. Rust, writing for information, got inquiries instituted, and the result is found to be, that a large quantity of black rain, similar to the Scottish, fell, and blackened rain water in tanks and clothes on greens, not only in Birmingham itself, but at rural places many miles distant, unaffected by soot and smoke, and even windward of that town. So far as known, however, no word has yet arrived of any volcanic outburst, although, judging from what has taken place in Scotland, a probability exists that some volcano has been in a state of activity, emitting its contents, whether it be heard of or not.

The following are extracts from Mr. Rust's work. Speaking of the first shower, he says :—

"The rain blackened, as if with sooty drops, all the white or light coloured clothes exposed to it on the bleaching or drying greens, so that they required to be re-washed; and cold water and soap were not sufficient to eradicate the stains, therefore hot had to be applied, and some of the clothes required to be boiled be-

* *The Scottish Black Rain Showers, and Pumice Stone Shoals of the years* 1862 *and* 1863. By the REV. JAMES RUST, A.M. W. Blackwood and Sons.

fore they regained their former colour; but by such hot applications, the spots were completely eradicated."

We may here remark, that one of the shirts, probably one of the most strongly marked, was sent up to Admiral FitzRoy, who wrote that he "could not discover the *least trace of discoloration* left on the shirt (which was somewhat *damp* when left at the Meteorological Department and opened)." And again, "The shirt does not show any *definite* markings, except in one place, not to be safely identified as a discoloration by *rained* water." Resuming Mr. Rust's narrative:—

"The rain-water collected by spouts from the roofs of houses, and conveyed into casks, was completely darkened, and filled with black particles for a time held in suspension. It was also hardened, so that, unlike all ordinary rain water, it did not froth or make a lather with soap, but curdled the soap, as water impregnated with carbonic acid gas, or hardened by carbon or soot does. It likewise gave out a nasty, disagreeable, stinking smell, so as to be quite unsuitable for domestic purposes. This must have been partly caused by sulphur, combined, perhaps free, but undoubtedly in the form of sulphuric acid gas. . . . . Immediately after this occurrence of the black rain, it was found that the sea had floated to land, and stranded all along that part of the coast of ten miles extent, which had been covered by the cloud, and no other part, a vast collection of pumice stones. They lay like a shoal of stranded fish. They could have been gathered along the shore by waggon loads the thousand yards, and there were pieces weighing half a pound avoirdupois. Such an occurrence had never been heard of before as having happened on the coast of Slains."

The chapter entitled "The result arrived at," is far too long (17 pp.) for verbatim reproduction, but it may be epitomized in a very few lines. Our author, who has referred to soot, smoke, chimneys, and carbon, on every fourth or fifth page of his narrative, rejects it directly he comes to theorize on the cause of the blackness of the water, and unhesitatingly affirms that it came from Vesuvius. He does not say why the pumice stones and fine impalpable powder travelled some 1500 miles at the same rate, which must have been the case if both arrived together; he does not say why the parish of Slains is so uniformly honoured with these showers, that "seven black showers" have fallen there, and only one in any other part of Scotland; he does not explain why the showers are seldom noticed further inland than Slains, nor why their breadth is so slight as 10 or 20 miles; but he calls upon us to believe that "Vesuvius emitted the pumice stones, and the black, sulphureous, carbonaceous, acidiferous substances contained in the showers;" that the light powdery dust and pumice stone blocks, half a pound in weight, travelled along at equal speed, and in close companionship, far above the snowy summit of Mont Blanc (or it would be blackened), and on, still on, for hundreds of miles, with not a variation of half a degree in their course, until they reach their destined resting-place on the Aberdeenshire coast, when *all* the pumice stones are dropped into the sea, and black rain on the selected village of Slains.

It is almost impossible calmly to review such a theory, and yet it is equally objectionable to allow it to pass unchallenged, especially looking at the ready circulation always accorded to the marvellous; perhaps divesting it of circumlocution, and stating it plainly as above,

it is almost sufficiently self-condemning. Who can believe in the transport to the same distance, and with equal velocity, of light, sooty matter, and blocks of pumice stone weighing half a pound (by the bye, they are said to weigh a pound in the newspaper extract; why is their weight doubled?). Who can believe that the wind on seven out of eight occasions blew in a perfectly uniform line, not varying 5 miles to the right or left, in a course between one and two thousand miles long? We will briefly remark, that residents in the neighbourhood do not concur in Mr. Rust's report of waggon loads of pumice, or in his theory of its origin; and that a specimen was submitted to Professor Hofman, who reported—

"Chemical analysis has proved the mysterious material you forwarded to me to be essentially a silicate of lime containing in addition, oxide of iron, alumina, magnesia, sulphuric acid, hydro-chloric acid, and phosphoric acid; of the latter only traces. These are exactly the constituents which are met with in the products of volcanic eruptions, but they are also the constituents of the slags which are found in every smelting furnace of our ironworks. Chemical analysis then is unable to decide the origin of the material in question. Had the specimen which you transmitted to me been placed in my hands without further remark, and had I been asked to state what I thought the substance was, I would have said *the frothy slag of an iron work.*

We have only to add, that such slags are quite common at Aberdeen (20 miles off), where there are at least four large iron foundries, two of them at the mouth of the Dee. Is it not more likely that the material travelled some 25 miles from Deeside, on the surface of the water, than that it floated gossamer-like in the air for sixty times that distance? But what of the black rain? We believe the origin is equally simple, and that it really arises from the chimneys, to which every one seems to have attributed it until Mr. Rust suggested the more marvellous origin. We do not presume to say whether it was smoke from Aberdeen, from passing steamers, or from the fish-curing village of Colliston; but we could hardly have stronger evidence that smoke is at the bottom of the whole matter than is afforded by the two other localities where "black rain" has been observed—viz., Carluke, amid the iron foundries of Lanarkshire, and Birmingham, where we were jokingly offered any quantity of "black rain" a year or two since, and where now Mr. Rust has discovered it.

Having inquired of one of the rainfall observers at Birmingham, we have been favoured with a reply from which the following is an extract—"I imagine that none but country people who wash in crystal, and the wonder-seekers who have a theory to support, would discover the rain of that day to be much blacker than usual."

We are by no means prepared to deny that rain *may* bring down volcanic dust and be thereby darkened, but if it does we shall surely hear of it not from one parish, or even one county, but from observers in all parts of the kingdom; therefore, as well as for the reasons already given, we take leave of Mr. Rust, begging him for his own sake and for the credit of the nineteenth century, rigorously to sift the facts ere he again announces a fall of black rain.

RAINFALL IN MAY, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground ft.	in.	Above Sea Level. feet.	Depth of Rain. Total Fall. inches.	Difference from average 1860–5 inches.	Greatest Fall in 24 hours. Depth. inches.	Date.	Days on which ·01 or more fell.
I.	ENGLAND.	Camden Town	0	6	100	2·03	— ·37	·63	31	10
II.		Staplehurst (Linton Park)	0	6	200 ?	·81	—1·43	·24	11	8
,,		Selborne (The Wakes)	4	0	500 ?	1·56	— ·93	·34	10	9
III.		Hitchen	2	0	240	1·04	— ·89	·25	11	9
,,		Banbury	7	0	345	2·17	— ·05	1·18	31	10
,,		Wisbech	0	6	10	1·74	...	·45	10	9
IV.		Bury St. Edmunds (Culford)	1	2	...	1·66	— ·50	·32	2	11
V.		Calne	0	11	250	1·15	...	·45	10	9
,,		Plymouth (Goodamoor)	0	2	580	3·16	— ·10	·63	31	12
,,		Barnstaple	0	6	31	1·05	—1·39	·44	11	8
,,		Taunton (Fulland's School)	1	4	...	1·64	— ·41	·83	27	11
VI.		Shrewsbury (Highfield)	5	6	200	1·56	—1·03	1·07	31	8
,,		Tenbury (Orleton)	0	9	200	·94	—1·94	·23	11	11
VII.		Leicester (Wigston)	0	6	220	1·10	...	·34	11	9
,,		West Retford	0	6	50	1·07	—1·23	·27	10	9
,,		Derby	5	0	180	1·75	— ·41	·58	31	11
VIII.		Manchester	2	7	106	1·54	—1·12	·76	11	9
IX.		York	0	6	50	·58	—1·37	·39	11	6
,,		Skipton (Arncliffe)	3	0	750	1·92	—1·43	·80	10	6
X.		North Shields	1	0	124	1·14	—1·50	·66	10	8
,,		Borrowdale (Seathwaite)	1	0	422	5·06	—4·48	2·24	9	8
XI.	WALES.	Abercarn	1	3	450	1·06	...	·40	11	12
,,		Haverfordwest	2	0	60	1·36	—1·36	·46	11	11
,,		Rhayader (Cefnfaes)	2	0	880	1·18	—1·67	·48	11	7
,,		Llanberis (R. Victoria Hotel)	1	0	370	3·68	...	·98	11	9
XII.	SCOTLAND.	Dumfries	0	5	70	1·41	— ·97	·54	10	11
,,		Hawick (Silverbut Hall)	4	0	512	1·40	...	·54	10	8
XIV.		Ayr (Auchendrane House)	2	3	94	1·94	—2·17	·88	10	11
XV.		Otter House	0	6	130	1·66	—2·08	·75	11	9
XVI.		Leven (Nookton)	0	6	80	1·50	— ·50	·56	10	9
,,		Stirling (Deanston)	0	0	130	1·11	— ·54	·50	10	9
,,		Logierait	1	0	250	·80	...	·30	11	5
XVII.		Ballater	0	10	656	2·30	...	1·10	11	14
,,		Aberdeen	4	8	115	1·72	...	·31	28	15
XVIII		Inverness (Culloden)	3	0	104	1·34	...	·30	12	9
,,		Fort William	0	8	20	2·06	...	·38	7	13
,,		Portree	0	4	60	1·95	—3·70	·50	8	13
,,		Loch Broom	0	8	48	2·16	...	·50	9	12
XIX.		Helmsdale	1	0	34	1·57	...	·27	2&11	16
,,		Sandwick	2	0	78	2·15	— ·11	·67	9	12
XX.	IRELAND.	Cork	6	0	65	2·11	...	·96	30	12
,,		Waterford	4	0	60	1·28	— ·97	·26	13	12
,,		Killaloe	5	0	128	3·06	— ·12	·88	13	15
XXI.		Portarlington	9	0	236	1·19	—2·00	·52	13	16
,,		Monkstown	0	6	100	1·58	— ·33	·72	31	10
XXII.		Galway	6	0	25	1·97	...	·39	8	17
,,		Bunninadden (Doo Castle)	1	0	...	1·71	...	·42	13	14
XXIII		Bawnboy (Owendoon)	1	3	218 ?	1·93	...	·63	11	12
,,		Waringstown	0	4	191	1·27	...	·42	11	9
,,		Strabane (Leckpatrick)	0	5	260	1·44	...	·37	10	15

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Gale at 6 p.m. and hail at 7 p.m. on 11th. Strawberry in blossom on 21st No rain from 12th to 26th; hail and heavy rain on 31st.

LINTON PARK.—A cold ungenial month, dry withering winds from E. and N.E., with scarce a particle of dew. Five frosty mornings, and two others nearly so, while in April we had only two frosts, and the average night temperature of that month was as near as possible that of May, being 39°·15 against 39°·81; the hottest day in April was 5° above any day in May. Hardy fruits may recover, but the hay crop must be short; hardy vegetation 4 or 5 days behind the usual time, delicate things still more so. T heard on five occasions.

SELBORNE.—Hail with T on 2nd; T with rain on 26th; boisterous evening with aurora on 11th. Max. 66° on 28th; min. 28° on 4th and 16th. Frost from 2nd to 5th, and 16th to 19th inclusive.

BANBURY.—T on 3rd, and, with one flash of L and heavy rain, on 31st. No rain from 12th to 31st; sharp night frosts to the end of month. Potatoes, Gooseberries, and wall fruit much injured. Max. 69°·5 on 19th. Min. 24°·5 on 4th.

WISBECH.—T on 4th & 27th. Solar halos on 8th & 30th. Oak in leaf on 15th, lilac in bloom on 9th, laburnam on 12th, honeysuckle on 21st, mountain ash on 22nd.

CULFORD.—T on 3rd, 4th, 12th, & 27th. Grass crisp with frost on 29th. Max. 75° on 23rd. Min. 28° on 3rd. Latter part of the month dry with cold east winds, fine gentle rain on 31st, which was much needed.

CALNE.—T S on 12th and 26th. L on 13th. Nights cold, 7 being frosty.

GOODAMOOR.—Much snow fell on the 3rd, on Dartmoor. Frost on 13 mornings. Max. 70°, Min. 22° on 4th. Wind easterly from 14th to 31st, at times blowing a perfect gale; 24th & 25th were very stormy, coming on at night.

TAUNTON.—Ice $\frac{1}{8}$-of-an-inch thick on 19th, with piercing east winds.

ORLETON.—Snow on the hills on the 2nd. Severe frost till 6th, and on the 30th, injuring potatoes, beans, and the shoots of ash and oak. T on 3rd, 4th, 27th, & 31st. No rain from 13th to 31st, the air being dry and sky cloudless; on 31st a little rain before sunrise, it then got cloudy with a strong cold east wind till 1.30 p.m., rain then commenced, increasing till 2 p.m., when for nearly an hour an immense fall of rain took place in gusts from 2 to 5 minutes; at 3 p.m. more than 1 in. had fallen, it continued all the evening till 9 a.m.; on the 1st of June I registered 2·655 of rain, the greatest fall in 24 hours since 1852. As I have always entered the rain to the day on which it was measured, this will come into June; two or three peals of T were heard on the 31st before the rain set in, but the heavy rain did not extend more than a few miles in any direction.

WEST RETFORD.—This has been a most ungenial month; cold, drying, easterly winds, and a lack of dew or rain, added to a low temperature, have kept back all vegetation. Frost on 8 nights; max. 76° on 19th; min. 28° on 4th. The rainfall for the first 5 months of this year is ·97 below the average of last 7 years.

DERBY.—Cold, ungenial month, vegetation making little progress, and the frosty nights seriously injuring potatoes and kidney beans, while gooseberries, currants, and small fruit have disappeared.

MANCHESTER.—T on 11th. Excessively dry and cold, with E. winds.

ARNCLIFFE.—An unusually dry month, with cold wind, mainly from the east.

N. SHIELDS.—Cherry in blossom on 18th, apple on 25th, strawberry on 27th.

SEATHWAITE.—Prevailing wind E., with extreme dryness; at 3 p.m. on 20th, at Tarn Bank, dry bulb, 72°·8, wet bulb, 57°·2, difference 15°·6.

WALES.

ABERCARN.—A very dry month; prevalence of N. and E. winds, but it has been generally calm.

HAVERFORDWEST.—The coldest May since 1855; prevailing wind E., doing much injury to vegetation, and causing sickness and mortality; from 11th to 13th a strong gale from E.

CEFNFAES.—The coldest May for many years; sunny days, but frosty nights retarding vegetation; water scarce, no rain from 13th to 31st. Max. 69°; min. 24°.

SCOTLAND.

DUMFRIES.—First part of month wintry, with frost and snow; on the 2nd the whole country white with snow, which however soon melted. 8th to 11th showery, thence to the end of the month dry with low night temperature. The pastures much injured by the drought; on morning of 30th, potatoes blackened by frost; on 31st a slight fall of snow; hay crop likely to be light; dahlias nipped on 15th, hawthorn in blossom on 22nd.

SILVERBUT HALL, HAWICK.—First half of the month cold and frosty, with hail, snow, and sleety showers; latter half generally fine, except the last four days, which were very cold with "hask" winds. Farmers are loud in their complaints about the scarcity of fodder; hay almost used up, and the pastures bare.

AUCHENDRANE.—The cold of the beginning of May, so generally noticed, was felt here also; ther. on 4 nights at or under 32° in the first week. 1·76 in. (of the total 1·94 in.) of the rain fell in the first 12 days.

OTTER HOUSE.—No rain from 12th to end of the month; the continued drought stints the hay crop, for "May makes the hay;" the other crops look well. On the 29th, a hail shower, and snow on the distant hills, which soon melted.

FORT WILLIAM.—For half the month there was a bright sun and soft airs from S.W. On Ben Nevis and many neighbouring hills a good deal of snow still remains, contrasting strongly with the summer aspect of things at a lower altitude. Fresh snow on the hills on 28th.

NOOKTON.—Very cold for the month; min. 32°·4 on 16th; from 19th to 26th clear, with east winds.

DEANSTON.—Max. 73°·3 on 23rd; min. 26° on 15th. Month very dry, with E. winds; end of month very cold and some hail-storms. Plum and peach blossoms much damaged, and little prospect of a moderate crop.

LOGIERAIT.—With very hot days, severe frosts at night, and a rainfall of only ·80, vegetation is necessarily backward and pastures suffering, but the cereals are as yet uninjured, and the fruit blossoms unusually luxuriant.

BALLATER.—The weather in the early part of the month very unsettled, the hills having a fresh coating of snow on several mornings. Fine from 13th to 26th; thunder on 10th, on which day the cuckoo was first heard. Max. 69° on 19th and 20th; min. 25° on 1st. Influenza very prevalent in the early part of month.

ABERDEEN.—Max. 64° on 23rd; min. 29°·3 on 1st; from 13th to 27th only one shower, but there were copious dews.

CULLODEN.—No rain from 14th to 29th; very hot on 25th; sharp frost on 1st; snow on 2nd; frequent hail-showers on 3rd; middle of month dry and sunshiny; heavy hail showers on 29th.

PORTREE.—Cold and squally, with showers of snow and rain to the 12th; then to 27th dry and hot, with cold nights; thence to end of month very cold, with hail showers; 31st warm. Frost on 14 nights. Max. 75° on 20th. The crops look better than might have been expected, the soil being soaked with rain of previous months, the hot sun brought vegetation forward in spite of the frosts. Cattle still healthy; no disease.

LOCHBROOM.—Cold, dry, and wet alternately, from 1st to 12th; then dry with hot sun till 20th, when the heat became intense; after 27th it changed again to cold, hail, sleet, and snow.

SANDWICK.—Ground white with snow on morning of 2nd; sun pillar in afternoon. Month cold and wet; the usual cold days from 10th to 15th; sleet showers so late as 27th and 29th. Prevailing winds, N. and E.

IRELAND.

KILLALOE.—Snow on first three days, and the whole month remarkable for the continuance of cold and parching winds.

MONKSTOWN.—Cold till 5th, then to 13th warmer, no rain from 13th to 31st, during which time cool (and at times harsh) winds from E., N.E., & S.E., prevailed; about 10 p.m. on 30th rain commenced and continued almost without intermission till noon 1st of June. Apples and strawberries likely to be a heavier crop than has been known for years, and all fruit seems promising.

DOO CASTLE.—Beginning of month cold, with frost, snow, and hail. No rain of any account from 13th to 31st, the prevalence of E. winds during this period tended to dry up the earth, and vegetation was thereby not only retarded, but to a certain extent blighted. Both man and beast felt the effect of this long-continued drought.

OWENDOON.—Cold at commencement, crops and grass much injured by the cold winds and want of rain. Potatoes injured by frost on 29th.

WARINGSTOWN.—Month on the whole dry, cold, and ungenial. Crops suffering from want of rain and cold nights; that they have not been worse is probably due to the large amount of sunshine raising the heat of the ground several degrees above that of last May. Evaporation 2·73.

LECKPATRICK.—Month set in cold, latter half excessively dry, with cold winds from E. Dry bulb on 23rd at 3 p.m. 68°, wet bulb 55°; max. 80° on 20th. much sickness, chiefly feverish colds, influenza, &c.

WANTED — A SIMPLE RULE FOR MENTALLY DETERMINING DIFFERENCES OF HEIGHT BY THE BAROMETER.

To the Editor of the Meteorological Magazine.

SIR,—I do not intend to put my name to this, so of course am free to indulge in a little autobiography, as a partial explanation, partial justification, of the request I have to make. Time was when I should have scorned to pen it, and been strongly inclined to chaff you for inserting it; but college days are long gone by; hunting, shooting, and fishing, have obliterated the lessons of Alma Mater, and I fully concur in Mr. Gladstone's opinion of the arithmetical powers of M.P.'s, if I may judge by my own.

Now, Sir, the country round my place is very hilly, and we often have discussions as to the absolute and relative height of different hills. As I (unluckily) am the only one just hereabouts who has a conveniently portable aneriod, I am expected to settle these discussions. I have not the least objection to taking the readings, but I do greatly object to the bother of working out the corresponding altitudes. Our highest hills are under 1500 feet, most of them under 1000, surely some simple rules can be given to find the difference represented, say by 30·07 at the lower station, and 29·48 at the higher station, on a hot day in summer—without a lot of corrections for temperature at both upper and lower stations, corrections for reading at sea level, &c. Admiral FitzRoy used to say something about each tenth of an inch equalling 100 feet, *that* is not accurate enough. Somebody (I forget who) gives each foot equal to ·0011 inch. Cannot some of your readers give us a few *simple* rules, (mind I protest against rule of three and logarithms) for deducing heights correct say to within 30 or 40 feet. If with simplicity they can couple greater accuracy, so much the better, but simplicity is the principal thing, and whosoever therewith combines the greatest accuracy, will most oblige,

Yours very truly,

June 5th, 1866. A LAZY MAN.

PERIODS OF DROUGHT AT CARDINGTON.

It may be interesting to some of the readers of this Journal to know the periods of dry weather of fourteen days and upwards since 1845, in one of the midland counties, where the monthly fall of rain is under 2 inches. I will also state the number of days in each year on which no rain fell, dates included.

		DAYS.			DAYS.
1846.	June 9th to June 22nd	14	1856.	Sept. 8th to Sept. 21st	14
,,	Sept. 7th to Sept. 22nd	16	1857.	Angust 17th to Sept. 1st. ...	16
1847.	March 8th to March 22nd ...	15	,,	Dec. 23rd to Jan. 7th, 1858	16
,,	Sept. 23rd to October 6th ...	14	1858.	March 18th to March 31st...	14
1848.	April 30th to May 18th	19	,,	June 19th to July 4th.....	16
1849.	July 4th to July 17th.....	14	,,	Nov. 10th to Nov. 25th.....	16
1850.	Feb. 17th to March 3rd	15	1859.	June 5th to June 19th	15
,,	March 5th to March 22nd ...	18	,,	July 5th to July 18th	14
,,	Sept. 5th to Sept. 19th	15	,,	Nov. 10th to Nov. 26th.....	17
1851.	June 17th to July 1st.....	15	1860.	October 27th to Nov. 10th...	15
,,	Sept. 6th to Sept. 23rd	18	1862.	July 21st to August 6th.....	17
1852.	March 3rd to March 29th ...	27	1863.	Feb. 5th to February 18th...	14
,,	April 1st to April 17th	17	,,	March 21st to April 4th.....	15
,,	June 30th to July 13th	14	,,	July 4th to July 18th.....	15
1853.	May 15th to May 28th	14	1864.	April 18th to May 1st.....	14
,,	July 30th to August 16th ...	18	,,	Sept. 24th to October 19th...	26
1854.	Feb. 24th to March 10th ...	15	1865.	April 20th to May 4th	15
,,	March 28th to April 20th ...	24	,,	June 4th to June 29th	26
,,	August 25th to Sept. 12th...	19	,,	August 30th to Sept. 20th...	22
1855.	April 13th to May 3rd	21	,,	Sept. 22nd to October 8th ...	17
1856.	Feb. 21st to March 16th ...	25			

Only seven times during twenty years have the number of dry days exceeded twenty at one time, and two of these times were in 1865.

The following shows the number of days in each year on which no rain fell, from 1846 to 1865, inclusive:—

Year.	Days.	Year.	Days.	Year.	Days.	Year.	Days.	Year.	Days.
1846 ...	201	1850 ...	223	1854 ...	230	1858 ...	240	1862 ..	184
1847 ...	230	1851 ...	217	1855 ...	225	1859 ...	219	1863 ..	234
1848 ...	169	1852 ...	204	1856 ...	214	1860 ...	169	1864 ...	250
1849 ...	193	1853 ...	194	1857 ...	220	1861 ...	204	1865 ...	232

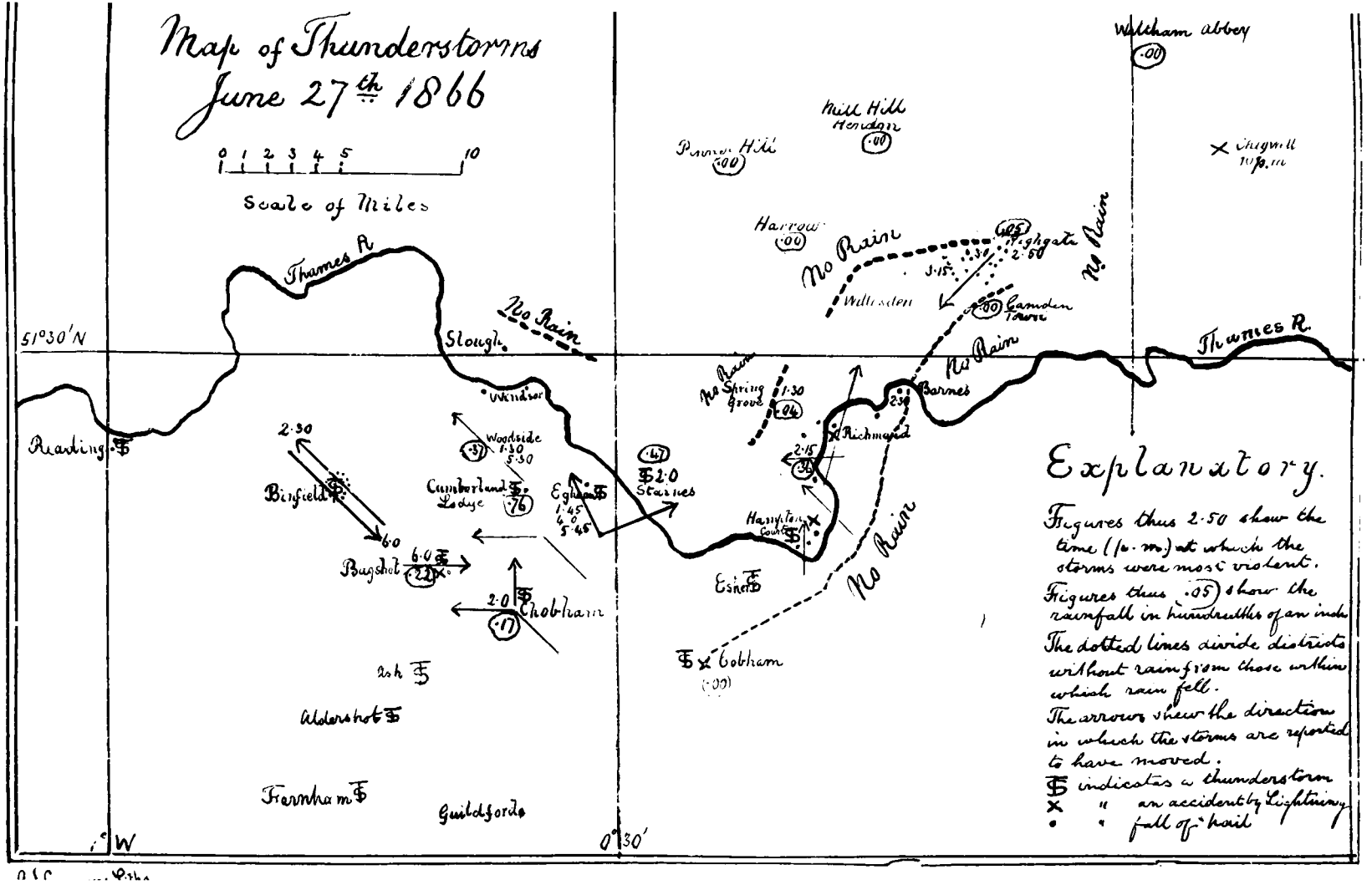
From these figures it will be seen that it was in 1864 that there were the greatest number of days on which no rain fell; also in that year the least fall of rain took place, being 5·564 inches below the average of twenty years.

Cardington is situated about three miles from Bedford, one mile from the river Ouse, 12 feet above the level of the river, and 100 feet above the sea level. The weather is generally very dry in summer, and very damp in winter.—JOHN MCLAREN, *Gardener to S. C. Whitbread, Esq.* [*From the Journal of Horticulture.*]

LATEST INTELLIGENCE.

THUNDERSTORM AT HEREFORD, June 1st, 1866.—A thunderstorm occurred here at 5.35 p.m. from N.E.; about 6.3 p.m. the wind suddenly veered to S.E., and produced some very heavy rain for a few minutes; the lightning was very vivid at this part of the storm, and was followed almost instantly by a crashing peal of thunder. The storm abated at 6.40 p.m.; the amount of rain collected during this time was ·40 in. Barometer 29·51. The air close and oppressive on morning of 2nd.—WM. COOKE.

STORMS IN THE ISLE OF THANET.—Sunday evening, June 3rd, was oppressively close at Margate; soon after midnight, lightning became frequent with thunder; the storm increased until about 4 a.m., when it was excessively violent, with heavy rain. The morning was showery, and while walking from Sandwich to Shepherd's Well Station, 6 miles N.W. of Dover, occasional distant thunder was heard but only a few drops of rain fell. On reaching Dover I found that it had been visited with a very heavy storm and over an inch of rain. The first storm was most severe over Ramsgate and Margate about 4 a.m.; the second over Hythe, Folkestone, and Dover, in the afternoon. At Hastings the rain was under half an inch.—G. J. SYMONS.


Map of Thunderstorms
June 27th 1866
0 1 2 3 4 5 10
Scale of Miles
Thames R.
No Rain
Slough
Windsor
Reading
2·30
Wokingham
Woodside
1·30
5·30
Bisfield
Cumberland Lodge
Englefield
1·45
4·0
5·45
2·0
Staines
6·0
Bagshot
6·0
2·0
Chobham
Ash
Aldershot
Farnham
Guildford
51°30′N
0°
30′
W
Willesden
Harrow
Mill Hill
Hendon
Pinner Hill
Wickham abbey
Highgate
1·30
2·50
3·15
Camden Town
New Spring Grove
1·30
Barnes
2·30
Richmond
2·15
Hampton Court
Esher
Cobham
Thames R.
Explanatory.
Figures thus 2·50 show the time (p. m.) at which the storms were most violent.
Figures thus .05 show the rainfall in hundredths of an inch.
The dotted lines divide districts without rain from those within which rain fell.
The arrows shew the directions in which the storms are reported to have moved.
indicates a thunderstorm
" an accident by Lightning
" fall of hail

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

VI.] JULY, 1866. [PRICE FOURPENCE, *or 5s. per ann. post free*

THE STORMS OF JUNE 27TH, 1866.

IN arranging the following account of the thunder and hailstorms of June 27th, I have placed in the forefront a list of places where neither hail nor rain fell, so as to define at once, as far as practicable, the boundaries within which the storms were confined. I shall then proceed with such narrative as I have been able to compile, and lastly give the data on which it is based.

PLACES HAVING NEITHER HAIL NOR RAIN.

NORTH OF RAIN PATH.—Waltham Abbey, Whetstone, Kingsbury, Harrow, Pinner.

SOUTH OF RAIN PATH.—Stoke Newington, Islington, Camden Road, Portman Square, West Brompton, Surbiton Station, Buxley Hill (near Claygate, Esher), Berkeley Street, Upper Harley Street, Bond Street, Pimlico, Camberwell, Wimbledon, Peckham.

PLACES JUST ON THE BOUNDARY OF THE STORM, AND HAVING ONLY A FEW DROPS OF RAIN.

Colney Hatch, very little. *Barnet*, a few drops. *Zoological Gardens*, at 3 p.m. a few rattling claps of thunder, heavy rain drops and a few hailstones, it only lasted 2 or 3 minutes. Sun shining brightly on E. and S.E. of the park all the time. *Dorset Square*, at 3 p.m. a few heavy claps of thunder, and a little rain. *Avenue Road*, very slight rain. *Lord's Cricket Ground*, slight shower, very large drops. *Lancaster Gate, Bayswater Road*, a few large drops at 1.30 and 3 p.m. *Upper Westbourne Terrace*, at 2.55 slight showers, very large drops. *Kingston*, only a few drops of rain. *Ham Lane near Esher*, just laid the dust. *Claygate near Esher*, very slight shower. *Slough* (400 yards south of the station), slight shower about 3 p.m. for 10 minutes.

NARRATIVE OF THE STORMS OF JUNE 27TH.

THE laws regulating the paths of thunderstorms being, I believe, entirely unknown, and probably very complex, it is probable that notwithstanding all my pains, and the somewhat copious details on which this narrative is based, some persons resident in districts whence we have no reports (such as Southall and Twyford) may be able to amend it; if they can, I hope they will.

There seems to have been about 3 p.m., *i.e.* shortly after the hour of maximum temperature, an almost simultaneous outburst of electric action at a variety of points, between the parallels of 51° and 52° north latitude, and extending right across England. It would be of surpassing interest to find these foci, and trace the onward course of each storm, but the task is almost too great; I therefore confine my narrative to those traversing the part of the country shown in the accompanying map.

The first storm seems to have formed between Windsor and Guildford soon after 1 p.m., and moved slowly to the N. until it reached the Thames

near Egham, when it appears to have divided, one portion passing up the river to Windsor, and the other down it over Hampton, Richmond, and Isleworth—that is to say, in a north-easterly direction. An unexplained and difficult fact is, that at Gomer House, Teddington, and at Richmond the storm is reported to have come from the E.; if so, how are we to reconcile it with the facts that half Richmond Park was dry and dusty, and that the observer at Spring Grove, who (on the assumption of an E. to W. motion) should have had the brunt of the storm did not, only registered 0·04 in. of rain, and accompanied his report with a map shewing S.S.W. to N.N.E. motion?

Evidence is wanting as to what occurred in the neighbourhood of Acton, but I am inclined to think it there met the Cricklewood storm (so called for distinction) was overborne by it, and carried back to Egham by about 4 or 5 p.m.

The boundaries of the Cricklewood storm having been described, it remains only to state that the storm appears to have been formed in Upper Holloway, to have skirted the southern side of Highgate Hill, then across Hampstead Village, and Child's Hill, on to Cricklewood where *alone* violent wind was felt, a fine poplar, being broken short off, and the road strewed with branches and twigs; I have not traced it much further to the west, but believe the suggestion previously offered is the most probable.

Some of our great authorities on wind have urged the existence of vertical rotary motion—(*i.e.* if a cyclone under ordinary circumstances is represented by a wheel revolving while lying on its side, a vertical cyclone would be represented by the same wheel revolving in its proper position on the axle of a carriage.) I have mentioned this because it seems to me the readiest solution of a puzzling fact, namely, that the largest hailstones did not do most mischief. Doubtless this was partly due to the relative hardness of the stones, but it was not *wholly* this, as many of the larger stones at Hampstead were of the hard species, yet the damage there was trifling, as it was also beyond Cricklewood, although the hail was large and hard, they fell "quite gentle like," as a native told me at Willesden Green. Now supposing (for it is only a bit of theory) there was such a vertical cyclone, its rotation being such that the motion of its lower half was in the same direction as the general course of the storm, it would solve at once several difficulties; thus—let its lowest portion be assumed to have swept near the surface while crossing over Cricklewood, it would then give wind force sufficient to break the poplar, and by increasing the velocity of the hailstones would produce equal or greater destructive power than where they fell without the wind and yet were larger; moreover, *if* this theory be accepted, it will also explain how large and heavy hailstones could fall "quite gentle like "a mile or two further on, for there the upward motion of the lower advancing quadrant of the cyclone would, by its tendency to lift the stones, partly counteract the force of gravity and so let them fall "quite gentle like" to the earth.

It only remains for me to thank those who have so kindly assisted

me in examining these storms and to subjoin abstracts of their letters which are more interesting than anything I could add.*

NOTES ON THE STORMS OF JUNE 27TH, 1866.

ABBREVIATIONS.—T for Thunder; L for Lightning; T S for Thunderstorm; H for Hail; R for Rain

MIDDLESEX.

SHORTWOOD HOUSE, STAINES.—Clear and warm till 2 p.m., when T S rose in S.W. opposite the wind, and seemed (when over the western part of Surrey) to divide, part taking the course of the Surrey Hills to the south of the Thames towards Kent —and part stretching towards Bucks and taking the hills to the north of the Thames valley, eastward towards Essex. At Staines we received the flank operation of both and escaped the full brunt of either, but having of course some T L and R as the clouds passed over—after a while the storm travelled back to the W. and continued rattling round Staines at intervals till 8 p.m. Total rainfall 0·47 inches.

CAMBRIDGE HOUSE, HAMPTON WICK.—Severe T S with H between 2 and 3 p.m. It commenced with wind N.N.E., then N.E., and E.N.E. (it came from E.N.E.); during its continuance wind shifted to W.N.W., storm following it; this took it over Teddington and Hounslow; storm went off about W.S.W.; wind changed suddenly at 4 to N.E.

THE GROVE, HAMPTON WICK.—T S passed over here from S.E. to N.W. in great violence between 2 and 3 p.m.; hail as large as marbles. Total R=0·18 in.

HAMPTON WICK.—Severe T S and heavy R from 2 to 5 p.m.

HAMPTON COURT.—Heavy T S with H 0·3 or 0·4 in. diameter, between 1.30 and 2 p.m., seemed to come over the Mitre Hotel [? from S.]

HAMPTON COURT.—Very violent T S from 1.30 to 2 p.m. H of all sizes from 0·1 to nearly 1·5 in. diameter (almost as large as hen's eggs) like broken pieces of ice. R fell in sheets.

HAMPTON COURT.—Violent T S between 1 and 2, hailstones mixed with large pieces of ice were 0·5 in. diameter.

BUSHEY PARK.—L struck one of the chestnut trees, heavy H fell, and the roads were flooded.

TEDDINGTON.—Very large H 0·6 in. diameter, some hard and clear like ice (these were occasionally depressed in the middle, thus ∞ [? two frozen together]); others were soft and opaque like snowballs.

GOMER HOUSE, TEDDINGTON.—Dark cloud appeared in S.E. about noon, but did not rise rapidly. Suddenly about 1 p.m. a mass of cloud overspread the zenith, quite as if newly formed there, moving rapidly and spirally; this joined the rising thundercloud, and some *very heavy* drops of R fell spreading on the stones to the size of a crown-piece. "I fear we shall have electric hail," I said to a friend, and in five minutes we did. The R thickened, but decreased in size, and a hailstone came down here and there, but soft, and of moderate size. Meanwhile the L was very vivid, and the T almost simultaneous. At 1.15 the size of the H suddenly increased, the average size and shape being that of acidulated drops, and of clear ice; but among them, here and there, at intervals of 2 or 3 yards amorphous blocks of ice, 0·5 or 0·6 in. across. There was not much wind, and the H and floods of R were driving from E, when suddenly at 1.30 another fall cut right across it, thus X, and presently all the pour was more strongly inclined from the W. than it had been from the E. At 2.30, the storm went away to W. and N., returning in a feeble manner at 4 and 7 p.m. Some glass broken, and trees knocked about.

TWICKENHAM HOUSE.—At 1.40, the R was too dense to see across the lawn, and the garden was flooded—very little, if any hail.

TWICKENHAM OBSERVATORY.—Violent T S from 1.30 to 3 p.m., with R and then H. Total R ·36 in. Wind E.

SPRING GROVE (between Hounslow and Isleworth).—Between 1 and 2 p.m. a T S worked down the Thames Valley over Twickenham, Richmond, and Brentford, when at the last-mentioned place it appeared to be met by a counter-current, and

* Additional information will be found on pages 55 & 56, in the notes of the regular contributors to the monthly table.

driven back. Only 0·04 in. of R fell here, and that was just after the above-mentioned retrogression.

HAMMERSMITH.—Heavy showers between 2 and 3 p.m., the drops of R being of remarkable size. Wind E., and some T in the N.

NIDDRY LODGE, KENSINGTON.—At about 4.30 p.m. I noticed an appearance which I pointed out as a small waterspout. It was a funnel-shaped cloud in rapid motion, but too far off to distinguish rotation. It seemed to break and rise into a heavy cloud. The direction was N. by W. (true), the altitude about 20° above the horizon, and the apparent length of the funnel about 5° when longest. It only lasted a few seconds, say 30, and was seen through a gap in clouds which were moving very slowly westward.

OAKINGTON, WEMBLY.—Heavy R in one hay-field, and at the rick to which the hay was being carried (400 yards off) none at all. T S seemed to come from S.E.

WILLESDEN.—Heavy R but little or no H. The R appeared to have fallen from a point 10° E. of the zenith—*i. e.*, nearly perpendicularly, and therefore there can have been no wind there.

WILLESDEN GREEN.—Heavy R and large H but it fell "quite gentle like."

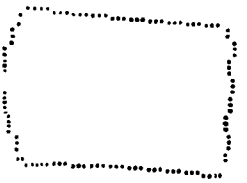
KENSAL GREEN.—Roads flooded by the heavy R.

HARLESDEN GREEN.—Very heavy R, but little or no H.

CRICKLEWOOD.—Storm swept down from Hampstead about 3.15, and for 5 or 10 minutes was very alarming; it fell most violently to the S. of the village between the Windmill Inn and Shoot-up Hill toll-gate. A violent rush of wind from N.E. snapped off a poplar 10 or 12 inches in diameter and strewed the road with twigs and small branches; the H broke a large number of windows, 9 panes in one, 10 in another, 14 in another, and lesser numbers in several others.

SHOOT-UP HILL.—"Being on Shoot-up Hill at a quarter-past 3 yesterday in my trap, the hail fell so heavily the turnpike man would not come out to take his toll of me, and I passed through without paying. It was very dark, and, though I have been 70 years in the world, I never saw such a sight before."

CHILD'S HILL, HAMPSTEAD.—Sudden and *sharp* H storm at 3 p.m., for 10 minutes, stones very large. The accompanying outline is reproduced from a line traced round one after it had partially melted; it must have been quite 1¼ in. by 1 in. It was not icy but like hardened snow. It rained in torrents.



FERN LODGE, HAMPSTEAD (near Jack Straw's Castle).—At 3 p.m. a very heavy hailstorm from N.E., lasting 5 minutes. Ten minutes after the storm, and when the hailstones had melted considerably, several measured more than ·7 in. diameter. They did not, however, fall violently, and only broke a few squares of greenhouse glass. The sun was shining brightly 3 out of the 5 minutes the storm lasted.

MOUNT GROVE, HAMPSTEAD.—Chiefly heavy R, but H whitened the grass. *No wind*, and R and H fell almost perpendicularly; no glass broken. Stones pear-shaped, the two diameters being often ·5 and ·3. In many the small end was clear ice, and the other end opaque—or there was a sort of nucleus or lagoon of clear ice surrounded by radiating striæ, some were granulated like sago pudding, with an opaque nucleus in the centre of each clear granule. R lasted about 20 minutes, and = 0·30 in. Southern half of sky cloudless. Two or three hundred yards N. of us a good deal of glass was broken. T S appeared to move in an easterly current.

ROSLYN, HAMPSTEAD.—Heavy T S from N.E. between 3 and 3.20 p.m. Loud T, and hailstones 0·6 in. diameter. R to the depth of 0·33 in.

MILITIA BARRACKS, HAMPSTEAD.—At 3.15 p.m. T, hailstones 0·6 in. diameter, but no glass broken. The R very heavy, and very large drops.

34, ADELAIDE ROAD, N.W.—Heavy R at 2.50 from N.E. for about 10 minutes—very large drops.

COLLEGE ROAD, ADELAIDE ROAD (200 yards from Chalk Farm Station).—Sharp R for about 20 minutes; H 0·65 in. diameter, but only lasted 5 minutes.

GOSPEL OAK FIELDS, KENTISH TOWN.—H nearly an inch in diameter. [?]

MALDON ROAD, HAVERSTOCK HILL.—About 3 p.m. a most extraordinary shower of H. Three panes broken facing N.E.

ST. ALBAN'S VILLAS, HIGHGATE ROAD (Upper Kentish Town).—Storm came up from E. ; H about 0·7 in. diameter, broke one pane in skylight ; not much R.

HIGHGATE NURSERIES.—No storm on 27th ; a little R at night amounting to 0·05 in.

SOUTH GROVE, HIGHGATE.—Violent H storm from 2.30 to 3 p.m. ; H nearly an inch in diameter ; measured one 2 or 3 minutes after its fall, and even then 0·75 in. square.

OXNEY VILLAS, ST. JOHN'S ROAD, UPPER HOLLOWAY (250 yards E. of Highgate Archway Tavern).—H 0·2 in. diameter, but was half melted. There seemed to be a T S in the S.W. at the time.

YORK ROAD, UPPER HOLLOWAY.—About 3 p.m. some claps of T, and for 5 minutes a few hailstones, the size of marbles, quite round and smooth.

TREDEGAR SQUARE, BOW ROAD, E.—A short, but very heavy R about 2 p.m., no H, but very large drops of R. Sky clear in N.E.

WHETSTONE.—At 2.45 p.m. I saw the clouds rising in one continuous line from S. to N., but when they had nearly reached the position where I was standing in Totteridge-lane, to my great surprise the whole body of them veered in the same straight line towards the E.—*i. e.*, moved eastwards parallel to their first position, remaining still in a line S. to N., they would cross the districts you mentioned in the *Times* of 28th, about 3 p.m. No R or H fell here at the time, but between 5.30 and 6, for a good quarter of an hour, R poured down in torrents, so saturating our roads that notwithstanding the heat, wind, and sunshine of 28th, there were no signs of dust until 29th.

[This communication is somewhat irreconcilable with the fact that all the glass broken in the Cricklewood storm either there or at Hampstead, is reported to face N.E. or E.; if the storm-cloud moved to the E., it would surely break the glass facing the W., not the E. and N.E., as was the case without any exception of which I have yet heard.—ED.]

SURREY.

GUILDFORD.—About 1.30 p.m., a very dense cloud formed over Ash, Aldershot, and Farnham, apparently the centre of a T S.—R very partial ; in places very heavy ; and 10 yards off not a drop.

COBHAM LODGE.—T S about 2 p.m., but no rain ; the L struck a chimney at the White Lion Hotel, Cobham-street, and passed through the parlour into the kitchen below ; the storm passed off in the direction of Weybridge, where they are said to have had hail as large as walnuts.

COBHAM.—T S about 2 p.m. with H. 0·2 to 0·5 in. diameter. It came from S.E. and passed on to W. and N. Total R=0·17 in.

BAGSHOT (2 miles N.E. of) a tree struck by L.

BAGSHOT PARK.—Slight rain (not enough to measure) about 6 p.m. This high table land is generally very exempt from local storms.

DUKE'S HILL, BAGSHOT.—About 1.15 p.m. T in N.E., whence it moved in a circular direction S. and W. until it appeared to be over Aldershot. Thence it appeared to take a N.W. course (still circling round without approaching us), to the direction of Windsor where it appeared to rage furiously, the T being almost incessant from 2.30 to 4, when it became more distant and only continued at intervals until a few minutes past 6, when a T S bore suddenly down upon us from the W. and raged violently for half-an-hour. Rain only fell during this storm, and it amounted to 0·22 in.

EGHAM.—"During the severe storm on Wednesday afternoon, between 5 and 6 o'clock, the electric fluid struck the telegraph wires at the railway station, and entered the office, when a terrific explosion took place, which completely demolished both instruments. Happily no one was near at the moment, otherwise serious consequences might have ensued. Mr. Clay, the station-master, and Mr. Channing, were standing by the entrance, and were for the moment stunned. The hail-stones which fell in the neighbourhood of Thorpe and Stroud were of immense size and did considerable damage to the garden lights and greenhouses, also destroying quantities of fruit and vegetables."—*County Times.*

EGHAM, (1 mile S.S.E. of.)—Distant T at 0.30 p.m., R began at 1.45, heavy shower at 3. Violent T S from 3.55 to 4.10. At 4.0, H 0·5 in. diameter and a

deluge of R. Notwithstanding the oppressive heat and the amount of R, it was more than an hour before all the H was melted. At 5.45 another T S. Hay laid and corn bruised.

PARKSIDE.—T S, H and heavy R from 2.30 to 4.40 p.m. Passed from S.E. to W.

ENGLEFIELD GREEN. (4 miles S. of Windsor.)—T and heavy R but no H.

CUMBERLAND LODGE, WINDSOR PARK.—T S at intervals from 3 to 8 p.m., H & R very heavy for half-an-hour. R to 9 a.m. 28th 0·70 in. Mangold wurzel leaves pierced by the H.

NORFOLK FARM. (1 mile from Cumberland Lodge.)—Many panes of glass broken.

ESHER.—Heavy R, but no H. No R 2 miles S.E. of this place.

CLAREMONT.—Heavy R, but no H.

RICHMOND.—From 1·30 to 2 p.m. H 0·4 in. by 0·25 in.

RICHMOND.—Hailstones 0·6 in. diameter.

RICHMOND.—Very large hailstones; plants much damaged, but no glass broken.

RICHMOND.—At 1.15 p.m. T S and very heavy R. H at 2 p.m. for 5 minutes from the E., diameter 0·25 to 0·30. The R at 1.15 was like tropical R, and quite perpendicular. The L struck the schoolhouse, but only loosened some stones—it crossed from one gable to the other without entering the building.

ST. MARGARET'S, RICHMOND. (On left bank of Thames, near the Railway Bridge.)—Between 2 and 3 p.m. very heavy R, with large H, many stones ·5 in. diameter, but no glass broken.

KEW OBSERVATORY.—Soon after 1 p.m. a heavy T S burst over this neighbourhood, with heavy R, and unusually large hailstones. Distant T throughout the afternoon. Total R = 0·26 in.

PUTNEY.—Much very loud T, but only a few enormously large drops of R.

MORTLAKE.—Heavy T and H the latter 0·5 in diameter and quite icy.

NASSAU SCHOOL, BARNES.—From 2.15 to 2.30 p.m. H 0·5 in. diameter shaped like a champignon without the stalk.

BERKSHIRE.

ROYAL MILITARY COLLEGE, SANDHURST.—Two T SS passed over here, the first at 3 p.m., from S.E. to N.W., the second between 5 and 6 p.m., from N. to S.W. Total R = 0·16 in.

WINDSOR.—T S, hailstones 0·4 in. diameter came from N.

WOODSIDE, OLD WINDSOR.—Three separate T SS; the first from 1 to 2 p.m., the second 5 to 6 p.m., and the third later in the evening, all came from E.S.E.; very little H and no damage; R to 9 a.m., 28th, 0·37 in.

CLEWER, NEAR WINDSOR.—Much glass broken by the H.

BINFIELD, BRACKNELL.—The first storm broke about 2.30 and lasted about 40 minutes, wind S.E. H very heavy and some stones an inch long; a little glass broken in greenhouses, as there was no wind, dwelling houses escaped. At 4.30 the barometer was falling rapidly, about 5 the wind chopped round to N.W. and the storm came back, the clouds twisting and turning in the most extraordinary manner. At 5.40 R commenced and by 6 the storm was awful. Nothing equalled it that I ever saw or heard (since the 27th May 1841). The L was incessant and there was no appreciable interval between it and the T. A few minutes after 6 the H commenced and in a short time the ground was covered with H stones and lumps of rugged ice; they varied in size from that of a large marble to a large-sized walnut. I was told ice had been picked up more than 2 inches long, I myself saw stones fully 1 inch in diameter—the shape was peculiar, like acid drops, the longer axis ¾ to 1¼ inches and the shorter ½ to ¾ inch, there was a darkish spot in the centre from which radiated lines towards the circumference. At 6.10, while watching the vane, the wind went round with a roar to S.E., and for a few moments a high wind added to the fury of the storm. For about ten minutes the turmoil was indescribable: roads, gravel paths, &c., were hurried away with leaves, plants and flowers, and the desolation caused in gardens was very great. The storm moderated at 6.50, the wind went back to W., and at 7 the storm ceased. It was felt in most of the adjoining parishes, but not in all, and the area of destruction, of which the church is the centre, was very small (about ¾ of a mile by ½ a mile); within it, however, upwards of 2000 panes of greenhouse and hothouse lights were broken. To give some idea of the force of the H, I may mention that I found the flower-beds pitted with

small holes, at the bottom of which were leaves and stalks of geraniums and other plants. The H lay thick on the ground next morning in shady places. Very little damage done to dwelling houses, except from water which made a clean sweep through some, and seriously injured others.

READING.—T S from S.S.E., commencing with heavy H at 3.15 p.m.; main body of T S passed south of this, but part seemed to go N. and rejoin the main body in the W. High wind from S.S.E. Storm over at 5.30.

ROUND OAK, GREENHAM, NEWBURY.—Sunshiny forenoon, T S, and heavy R from 1 to 1.20, hot sun and very close from 1.20 to 3.30, heavy R 3.30 to 6, fine again till 7.40, R from 7.40 till 8.45, fine and moonlight afterwards—total R, 1·70 in. The storm seemed to work round here, with no wind to blow it away.

LAMBORNE, HUNGERFORD.—The TS began at 4.30 p.m., H from 5.45 to 6, breaking many windows and hundreds of greenhouse panes. The hailstones were mostly flattened ellipsoids, principal diameter over 0·75 in. smaller diameter 0·5. It was the most violent T S for many years. Acres of young turnips and swedes were ploughed up and washed away by the H and R.

CHALLOW STATION TO LAMBORNE.—Found that no H fell except in Lamborne. but the R extended over the downs into the Vale of the White Horse.

KENT.

BIDDENDEN, STAPLEHURST.—The 27th was beautifully fine, but the barometer fell steadily; very heavy T clouds appeared in S.S.W. about 7 p.m., and at about 8 p.m. we had a T S, and a good deal of R, the T S apparently came up from the sea about 20 miles off and passed away to N.N.E.; it did not last more than half-an-hour.

FOLKESTONE.—At 3 p.m. a heavy H storm (H stones about 0·4 in diameter) with T. Storm lasted about 20 minutes; what little wind there was, was from E.N.E.

PAVILION, FOLKESTONE.—About 4 p.m. one loud clap of T preceded a shower of R and H (of the usual size). Clouds had been gathering about an hour; the R was general and highly beneficial in this district, and continued the whole evening; no wind, and the sea like a mirror.

SUSSEX.

STEYNING.—On 27th a dense nimbus cloud passed over in a current from N.E. to S.W., and commenced discharging rain and hail, accompanied by vivid lightning and loud thunder at about 3.30 p.m. At 3.45 p.m. when it ceased, the lawn was white with hailstones, many of them of large size, oval in shape, ¾-inch × ½-inch (the major axis of one was certainly ⅞-inch), and my rain-gauge registered 0·23 inch of rain during the brief quarter-of-an-hour of the storm. The thermometer in shade fell from 80° before to 67° after the storm. The barometer having fallen, previously stood at 29·84 (uncorrected). There was scarcely any wind. The storm was very partial. At a place one mile N. of us there was no rain, and no heavy rain beyond a line half-a-mile to the E.S.E., which seems to mark a comparatively narrow band of rainfall; yet, within the line it was severe, as 80 small panes of glass were broken at the Vicarage; our own glass being stouter, escaped breakage. I do not hear of any glass in dwellings being broken, but sky-lights may have suffered. The character of the storm was notable from its suddenness: many clouds of the cumulus character had passed over previously, and gathered in the W.S.W., beneath an over-spreading canopy which was nearly stationary all day; at length, a denser gathering of cumulus came up from the N.E., but without discharge until its south-western limit fell under the verge of the upper canopy when it broke slightly N.W. of this town, and soon in a perfect deluge over us.

HAMPSHIRE.

MILLAND HOUSE, LIPHOOK, HASLEMERE.—Signs of an approaching T S about 2 p.m. but no R till 2.30 when one or two showers fell; the main T S did not, however, pass over here.

WAINSFORD, LYMINGTON.—Between 1 and 2 p.m. a T S came from the E. up the Solent as far as Southampton Water; it then divided, part went along south of the Isle of Wight, the rest up Southampton Water into the New Forest, the L was frequent and T loud, I should think the T S was severe at Southampton; we

only had the extreme edge of it, the total R being only 0·02 inches. The New Forest together with Southampton Water appears to attract all the storms whether E. or W., and they rarely come here.

HERTFORDSHIRE.

HITCHIN.—Smart T S about 3 p.m. for 10 minutes. It was most curiously local, the men in one part of a field complained of R while those in the other had bright sunshine and no R. The roads shewed the same, in one part streaming with R, in another the dust lay thick and undisturbed.

ESSEX.

CHIGWELL.—At 10 p.m two or three very loud claps of T, with a little R; a tree struck in the neighbourhood.

DEBDEN GREEN, LOUGHTON.—This place was skirted by a T S last evening, the clouds being of a singular form. A few minutes after 10, L began in the neighbourhood of Epping, but it did not come very near here.

WILTSHIRE.

HIGHWORTH, SWINDON.—Clear on 27th up to about 5 p.m., wind E.N.E. Clouds came up chiefly from the wind, and at a little before 6 lightning began. The fall commenced about 6 p.m., and was exceedingly heavy; the stones were, so far as I saw, mostly of the shape of truncated cones, about $\frac{3}{8}$ths-of-an-inch at bottom and and 3-16ths at top, and perhaps $\frac{1}{4}$ inch or less high. The hail was soon over, but rain continued for about an hour. I drove out about 7.30, and while driving saw several thunder-clouds and much lightning. The clouds seemed to go in two directions—one about 4 miles to the west seemed to be going W.N.W., while one about 4 miles to the south seemed going westward. I saw rain falling from both up to near 9 when I returned. The sky was clear at 10. I found ·72 (seventy-two) in my gauge this morning, and I expect there was a good deal splashed over, especially at first, and probably but little hail was caught.

LANDFORD (9 miles S.E. of Salisbury).—About 3 p.m. T L; heavy R and large H; R at intervals to 7 p.m. = ·60 in. I hear that 3 miles off they were carrying hay all the time.

TROWBRIDGE.—T S and R amounting to 0·12 inch.

WESTBURY.—Streets are said to have been deluged with rain.

SOMERSET.

FROME.—Heavy R for two hours.

YEOVIL.—At 3.30 p.m. violent T S. R at first in very large drops, afterward almost in sheets; no H.

BATH.—This city was visited by a very heavy T S between 5 and 6.45 p.m. In less than an hour ·81 in. of rain fell; L exceedingly vivid.

BATHEASTON.—Very heavy T S began about 5.35 and R was very heavy for 2 hours—H said to have been as large as an acidulated drop—I picked up some as large as a good sized pea.

DORSET.

CHALBURY, WIMBOURNE.—A T S began here soon after 2 p.m. and lasted till 3.30, a little H about 3 p.m., about 0·4 in diameter—total R, 0·47 in.

GLOUCESTERSHIRE.

MONTPELIER, BRISTOL.—Very violent storm, the R here amounted to 1·12 in.

CLIFTON, BRISTOL.—The great heat of the last two days (84° 25th and 83° 26th) has been succeeded this afternoon (Wednesday, June 27th) by the most severe thunderstorm experienced here during several years.

Even before noon, to-day, suspicious-looking masses of cumulus cloud were observed to be gradually overspreading the eastern portion of the sky. By 3 p.m. it became evident that a thunderstorm was imminent, and shortly afterwards some distant growls, with a few drops of falling rain, indicated that the storm had commenced within no great distance. These threatenings, however, passed off in a measure, and it was not until 5 p.m. that the gathering of heavy masses of cloud in the south-east betokened the near approach of a considerable storm. About 5.20 a peal of thunder was heard, and from this time till 7.40—an interval of 2 hours and 20 minutes—flashes of lightning and peals of thunder succeeded each other with

a rapidity not often witnessed. At least a hundred flashes were observed; between 50 and 60 were actually recorded. The storm probably extended over a large area, but at all events this district was completely enveloped by it, the focus of electrical disturbance appearing successively at almost every point of the compass. Some localities, however, seemed to be specially selected as points for electrical discharges. For example, between 6.12 and 6.24 p.m. an extraordinary number of flashes appeared to strike the earth at points from two to five miles distant in the N.W. It would not be surprising if accounts were received of damage in that direction. From 6.45 p.m. and during the remainder of the storm, the lightning was chiefly in S.E., a large number of the flashes being from 2 to 3 miles distant in that direction. Towards 8 p.m. the sky began to brighten in the north-west, and the heavy mass of clouds in the opposite quarter slowly sank towards the horizon. During the storm two flashes were especially near my place of observation—one at 5.48, in which the interval between the lightning and thunder was scarcely appreciable, the other at 7.33, in which the interval was about one second. The thunder on these occasions was very loud and crashing, though not so loud as is sometimes heard.

Many of the flashes were exceedingly brilliant and beautiful. A large number were vertical in direction, others were horizontal, or formed long jagged festoons across the sky. In several instances a flash was made up of three or four distinct discharges, but so nearly simultaneous that the lines of light combined to produce a single figure, which was often that of an arch touching the horizon at two distinct points. It is very rarely indeed that so excellent an opportunity occurs of studying the forms of lightning. A photographer might have secured the portraits of scores of flashes.

Rain fell to the amount of *eight-tenths of an inch*. Early in the storm hail-stones, 0·33 in. in diameter, fell thickly for a short time.—GEORGE F. BURDER, M.D.

CASUALTIES IN BRISTOL FROM THE THUNDERSTORM.

The heavy thunderstorm of last evening has done some damage in the city. The vast quantity of water which poured through the thoroughfares tore up gravel and stones, and on St. Michael's Hill, the avenues leading to Kingsdown and other hill sides, the soil from gardens and the gravel from the streets were carried down with the stream and deposited on the first levels.

At half-past five a man named Charles Abraham, residing in Castle Court, Temple Street, and in the employ of Mr. Baker, contractor, was riding a horse at the bottom of Clare Street. The lightning struck a saw which he carried in his hand—and he was knocked off the horse. He was taken up insensible, and it was feared that he was dead: but on his being taken into the shop of Mr. Sprackett, chemist and druggist, and attended to, his consciousness was restored, and he was carried home by some of his fellow-workmen. He appeared to be not much hurt.

In the Stapleton Road, the telegraph wire connected with the chimney of a dwelling-house was struck by the lightning. The wire was detached from the post by which it was fastened, and about three hundred yards of it fell almost to the ground. The occupier of the upper room of the house—a female—fainted at the occurrence.

Between five and six o'clock information was received at the various engine-houses that a fire had broken out on the premises of Mr. S. Jones, at the top of Stoke's Croft. The reels were at once manned, and away went the men through the pitiless storm. Upon their arrival it was found that the lightning had struck the chimney, causing a rent of some ten feet, from the chimney-pot to the roof. It had then evidently passed into one of the front bedrooms, and out through an open window. Fortunately no one was in the house at the time.

The lightning caused considerable damage to chimneys in various parts of the city, including a rather large one in Leek Lane; and a saw which was being carried by a man in the Pithay was damaged.

MONMOUTHSHIRE.

NEWPORT.—The T here was terribly grand and the L exceedingly vivid. The R and H was heavier than has been known for many years, and did a great deal of

damage. In Dock Street hailstones fell of upwards of an inch and a quarter in diameter; one was picked up and measured, and its circumference was *four inches.* Square pieces of ice of *upwards of a pound weight each** were found in the neighbourhood of the Docks. High Street was overflowed, being a foot deep in water, and the cellars were in most cases filled. The cellars of Messrs. Davis, Bros., grocers, were filled with water, and goods were damaged to the extent of £250 or £300. Nearly all the garret windows in Dock Street have been broken. Strange to say, the country districts to the north-east of Newport, only some 2 or 3 miles distant, were not visited by the storm.

NEWPORT.—At half-past five o'clock a most frightful storm broke over this town, and lasted with the greatest severity for about one hour. The rain descended so thick and with such velocity that the spray from it was like the spray of mighty waves dashing against each other. Hailstones, or rather large lumps of ice, fell of considerable size, and some of them were picked up weighing at least a couple of ounces. The lightning was excessively vivid, and the thunder was close and heavy; in fact, it resembled the discharging of a large park of heavy artillery. The damage done to the standing crops and other property must be immense.

GLAMORGANSHIRE.

TYNANT, PENTYRCH.—The T S extended over a long tract of country, reaching to Bristol and Newport on the east, and thunder was heard as far as Neath in the west. The weather was intensely hot, and the storm at Pentyrch commenced with great suddenness at 5 p.m. Rain fell in sheets, and ran in rivulets from the hill-sides; in a little more than half-an-hour it amounted to 0·68. It was accompanied by hail of large size and various shapes, some round, others oblong, and some of them were irregularly-shaped masses of ice, quite clear like glass. The greatest diameter of any of them was half-an-inch. Many buildings were struck by the lightning, and a few cattle were killed, but no human being injured. The hail did some damage to the standing corn. Over the area I have mentioned there were several centres of intensified electric disturbance, of which Newport appears to have been the chief in severity.

SIMPLE BAROMETRIC FORMULÆ.

IT will not probably be thought surprising that the letter of "A Lazy Man" has elicited several replies; from them we select three, illustrating varieties of method, inserting them in the order of their receipt.

June 19th, 1866.

SIR,—If your correspondent, "A Lazy Man," will purchase Negretti & Zambra's "Treatise on Meteorological Instruments," (price 5s.), he will find at p. 56 a rule laid down, that for measuring heights not exceeding many hundred feet above the sea level, by means of the aneroid, this simple method will suffice—"Divide the difference between the aneroid readings at the lower and upper stations by ·0011, the quotient will give the approximate height in feet," and at the same page he will find out (by an example given, and actually worked out; and with reference to certain tables *contained in the same work*) how to deal with cases where greater heights are concerned and greater accuracy is required—and he will ascertain that what he requires can be easily attained without reverting either to rule-of-three or logarithms.—I am, Sir, your obedient Servant,

A. K. C.

SIR,—In answer to the letter of "A Lazy Man," in the last number of your Magazine, I take the liberty of informing him that I have for many years amused myself with barometrical measurements. When I have had no object in view but amusement, I have contented myself with calculating according to a scale engraved on one of Sir Henry Englefield's portable barometers. That scale is as follows:—

* **Surely an exaggeration; they would have been 3-inch cubes, or spheres about a foot in circumference.**

When the quicksilver stands at	ft.		ft.
31·0 inches, ·1 of an inch answers to	84	27·75 inches, ·1 of an inch answers to	94
30·3 ,, ,, ,, ,, ,,	86	27·15 ,, ,, ,, ,, ,,	96
29·6 ,, ,, ,, ,, ,,	88	26·55 ,, ,, ,, ,, ,,	98
28·95 ,, ,, ,, ,, ,,	90	26·00 ,, ,, ,, ,, ,,	100
28·35 ,, ,, ,, ,, ,,	92		

If this scale be right, your correspondent would be wrong if he adopted the idea that the tenth of an inch represented 100 feet in altitude at whatever height the quicksilver stood in the barometer.—Believe me, thankfully yours, W. S. H.

11, Offord Road, N., 20*th June*, 1866.

DEAR SIR,—A correspondent of your *Meteorological Magazine* requires a simple rule for calculating heights from the readings of an aneroid. I think the one which I now send you will suit his purpose. It will give, within 20 feet, the elevation of hills not exceeding a quarter of a mile in height.

RULE :—Read the aneroid to the nearest hundredth of an inch ; subtract the reading at the upper station from that at the lower, leaving out, or neglecting, the decimal point ; multiply the difference by 9 ; the product is the elevation in feet.

Example :—Lower station ... . 30·25 inches.
Upper ,, ... 29·02
123
9
Elevation .... 1107 feet.

Your's respectfully,
R. STRACHAN.

We cannot but think our self-styled "lazy" friend will be gratified with the above letters—especially Mr. Strachan's, which is temptingly easy, and, though we believe at high temperatures not quite so accurate as he assumes, it is sufficiently so for ordinary purposes, and is the very embodiment of simplicity. The following table we constructed for our own use in cases of small altitudes and where extreme accuracy was not necessary.

Mean of Barometer at two Stations.	Mean temperature.		
	25°	50°	75°
inches.			
27	·00104	·00099	·00094
28	·00108	·00103	·00098
29	·00112	·00107	·00102
30	·00115	·00110	·00105

RULE :—Take from the table the value corresponding to the approximate *mean* of the upper and lower barometers, and to the mean temperature (which may be guessed at) and divide the difference of the barometers by it, the quotient will be the height in feet.

Example :—Base of Ben Lomond... 29·890 Mean temperature 50°
Summit of ,, ... 26·656 Mean barometer 28·27
Difference .... 3·234

·00104)3·234(3110 = height in feet.
312
114
104
100
104
4

The true height being 3116 ft.
The above rule gives 3110 ft.
And the error is..... 6 ft.

RAINFALL IN JUNE, 1866.

Div		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	3·98	+ ·94	1·33	30	12
II.		Staplehurst (Linton Park)	0 6	200 ?	3·40	+ ·66	·98	4	9
,,		Selborne (The Wakes)	4 0	500 ?	2·84	— ·39	·47	5	12
III.		Hitchen	2 0	240	2·61	— ·03	·61	1	14
,,		Banbury	7 0	345	2·46	— ·81	·70	1	15
,,		Wisbech	0 6	10	2·50	...	·74	4	13
IV.		Bury St. Edmunds (Culford)	1 2	...	3·42	+ ·84	1·25	4	10
V.		Calne	0 11	250	3·02	...	·79	30	13
,,		Plymouth (Goodamoor)	0 2	580	2·94	—2·21	·76	18	18
,,		Barnstaple	0 6	31	2·48	—1·64	·51	6	13
,,		Taunton (Fulland's School)	1 4	...	·81	—2·06	·20	18	10
VI.		Shrewsbury (Highfield)	5 6	200	3·64	+ ·70	·61	12	12
,,		Tenbury (Orleton)	0 9	200	5·79	+2·27	2·65	1	20
VII.		Leicester (Wigston)	0 6	220	2·41	— ·35	·54	4	15
,,		West Retford	0 6	50	2·99	+ ·83	·65	18	17
,,		Derby	5 0	180	4·11	+1·22	·67	21	17
VIII.		Manchester	2 7	106	3·98	+ ·63	1·06	12	16
IX.		York	0 6	50	2·57	+ ·47	·58	19	16
,,		Skipton (Arncliffe)	3 0	750	3·46	— ·64	1·02	12	14
X.		North Shields	1 0	124	1·68	—1·06	·45	11	17
,,		Borrowdale (Seathwaite)	1 0	422	6·57	—3·94	1·55	21	18
XI.	WALES.	Abercarn	1 3	450	3·59	...	·77	4	13
,,		Haverfordwest	2 0	60	3·97	+ ·32	.91	21	15
,,		Rhayader (Cefnfaes)	2 0	880	3·87	— ·11	·86	1	16
,,		Llanberis (R. Victoria Hotel)	1 0	370	8·44	...	1·78	13	17
XII.	SCOTLAND.	Dumfries	0 5	70	1·84	—1·07	·51	30	13
,,		Hawick (Silverbut Hall)	4 0	512	1·27	...	·26	30	15
XIV.		Ayr (Auchendrane House)	2 3	94	2·17	—1·18	·37	12	12
XV.		Otter House	0 6	130	3·14	— ·70	·83	21	21
XVI.		Leven (Nookton)	0 6	80	1·35	— ·89	·52	20	12
,,		Stirling (Deanston)	0 0	130	2·58	— ·34	·82	20	12
,,		Logierait	1 0	250	1·64	...	·71	20	7
XVII.		Ballater	0 10	656	1·97	...	·52	20	10
,,		Aberdeen	4 8	115	1·45	...	·66	20	16
XVIII		Inverness (Culloden)	3 0	104	·63	...	·18	18	9
,,		Fort William	0 8	20	2·69	...	·65	30	18
,,		Portree	0 4	60	2·78	—2·00	·46	30	14
,,		Loch Broom	0 8	48	1·27	...	·28	16	15
XIX.		Helmsdale	1 0	34	2·12	...	·46	20	13
,,		Sandwick	2 0	78	1·87	+ ·34	·36	20	8
XX.	IRELAND.	Cork	6 0	65	4·27	...	·92	13	14
,,		Waterford	4 0	60	3·91	+ ·93	·64	11	17
,,		Killaloe	5 0	128	4·48	+ ·86	·82	17 & 18	20
XXI.		Portarlington	9 0	236	3·73	+ ·48	·57	4	21
,,		Monkstown	0 6	100	3·73	+1·12	1·14	18	17
XXII.		Galway	6 0	25	4·28	...	·61	5	22
,,		Bunninadden (Doo Castle)	1 0	...	4·61	...	·78	3	20
XXIII		Bawnboy (Owendoon)	1 3	218 ?	3·40	...	·46	20	21
,,		Waringstown	0 4	191	2·57	...	·47	12	15
,,		Strabane (Leckpatrick)	0 5	260	1·98	...	·27	20	19

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm.

ENGLAND.

CAMDEN TOWN.—High temperatures from 20th to 27th. Max. 86°·0 on 27th. T on 27th at 3 p.m., and three violent T SS on 30th, when R fell at the unusual rate of 4 inches per hour; this rate was only maintained for half-a-minute, but several times the rainfall was ·05 per minute.

LINTON PARK.—T(both near and distant) more prevalent than usual. TS unusually near on 22nd, 27th & 28th. Rain heavy and much above the average, while from the sunshine being much less, things are late, the wheat not being in ear till the 21st, the latest I have on record, except 1860 when it was one day later. Most things promise well. Greatest heat on 9th and 23rd.

SELBORNE.—T on 16th, 17th, 21st, and 27th at intervals all the afternoon, and at noon on the 30th. Max. 79°·0 on 28th; min. 38° on 17th: prevalent winds S.E. to S.W. Hail on 16th at 11·30 p.m.

HITCHIN.—The rain on the 27th fell about 3 p.m., during a storm very similar to that mentioned in the *Times*; it did not extend half-a-mile, and there was scarcely any cloud; it went in a S.W. direction. Tremendous T S on 30th.

BANBURY.—T SS on 1st and 16th, on which day an old oak tree was set on fire by the L at Wroxton Park, 2 miles from here. Max. 83°; min. 39°·5. Distant T S on 27th.

WISBECH.—T S at 3 a.m. and at 10 p.m on 4th, two horses killed during the latter storm; slight T S on 30th, at 4 p.m.

CULFORD.—A very severe T S on the 4th, with heavy rain and hail. Several accidents occurred; one fatal to a poor woman by the sick bed of her husband. A sharp hailstorm also on the 17th, lasting only a few minutes, but doing considerable damage. Weather warm, especially about the 10th, and during the last week. Max. 84° on 26th; min. 40° on 17th.

CALNE.—T S on 1st at 4 p.m., and 27th from 5 to 9 p.m.; fine and warm till 17th; intense heat from 21st.

GOODAMOOR.—Much distant T with great heat (but no rain) during the last week.

TAUNTON.—T S on 26th [27th ?], the storm breaking N.W. of the Vale of Taunton around Axbridge; hailstorm at 11 p.m. on 16th.

ORLETON.—T on 1st, 4th, 5th, 16th, and 27th; on the 30th loud T and much L.

WEST RETFORD.—T on 9th and 16th; T S distant in W. at 1 p.m., on 30th. With the exception of the 1st, this has been a pleasant and propitious month; the abundant rainfall, and the generally high range of temperature have brought on vegetation, but fruit trees suffered so much from the frosts of May that the produce (with the exception of apples) is most scanty. Temp. has been above 80° on 7 days. Max. 86° on 27th and 30th; min. 37° on 20th.

MANCHESTER.—Black bulb in vacuo. 141°·2 on 27th.

ARNCLIFFE.—The latter part of the month unusually sultry.

NORTH SHIELDS.—Lily of the valley in flower on 3rd. French rose on 9th. Grass cut on 25th. T on 19th.

SEATHWAITE.—First three weeks excessively cold, raw, and unseasonable. Last week unusually hot, only four days on which the rainfall exceeded ½-an-inch.

WALES.

ABERCARN.—T SS have been prevalent; there was a very severe one on the 27th at Newport 10 miles distant accompained by H stones as large as an egg causing much damage. The month has been comparatively dry, the latter part especially being hot, there having been eight cloudless days on which the temperature in the shade ranged about 80°.

HAVERFORDWEST.—It was wet and cold. Wet and chilly for the time of year till the 22nd, when a sudden change to warmer weather set in, which coming after

the seasonable rain of the first three weeks had a most salutary effect on the hay crop much of which was cut and carried, during the last week. Corn crop and country generally looking well; for six days the heat was excessive. Max. 83°·5.

CEFNFAES.—T S with forked L from 5 to 8 p.m. on 27th in S. & S.E., on which day the temp. in shade was 92°. Cold till the 20th. Last eight days intensely hot.

SCOTLAND.

DUMFRIES.—Till the 24th the weather cold and ungenial; frosts on 16th and 17th, injuring the potatoes on damp soils; from the 24th very hot to the end of the month. On the afternoon of 30th heavy rain, very beneficial to the potatoes which are very bare and scorched. Fine weather at the close for haymaking, but the crop light.

SILVERBUT HALL, HAWICK.—The month, on the whole, has been warm and dry, although there were hail showers on the 15th and frost on the morning of the 19th, which in many instances blighted the potatoes, French beans, and dahlias. On the evening of the 24th the sky was singularly and beautifully dappled, which was followed on the 25th by a perfectly clear and cloudless sky. Thunder heard in the distance on the afternoon of the 29th.

AUCHENDRANE.—The drought of this month has been injurious to vegetation, (both the rainfall and the number of days on which it fell being below the average,) especially on light soils, and some kind of crops suffered severely from the unusual intensity of the cold from the 18th to the 20th inclusive, particularly during the night of the 19th. Max. at 78° on 25th and 26th; min. 32° on 19th.

OTTER HOUSE.—Very warm from the 22nd to 30th. Max. 79° on 26th; hail on the 19th.

NCOKTON.—Great heats, with much sun, and deficient moisture.

DEANSTON.—No thunder during the month. Max. 81° on 26th; min. 30°·3 on 19th. Sharp frosts on mornings of 18th, 19th, and 20th; potatoes much damaged.

LOGIERAIT.—The month opened with great warmth; on the 15th the temperature suddenly changed, till on the night of the 17th there was a keen frost, in many cases blackening the potatoes and injuring tender flowers. On the same night Ben Lawers was covered with a coating of snow—a circumstance reported not to have previously occurred at this season for upwards of 40 years. The close of the month hot, the temperature ranging from 75° to 80°. With the exception of hay, all the crops look well.

ABERDEEN.—T on 16th, 19th, 26th, and 27th. On the 11th, hailstones $\frac{5}{8}$-of-an-inch in diameter, 24 picked up at random weighed 144 grains. Potatoes injured by frost on the nights of the 18th, 19th, and 20th.

PORTREE.—There were frosts on the 1st, 17th, 19th, and 20th, and heavy hail showers and squalls 16th and 17th. On the whole the month was very dry and warm; the pasture grass has suffered greatly from the heat and dryness. Swarms of worms from 2 to 3 inches long, something like catterpillars, have caused sad devastation in the grass in some parts of the island during this month, in some making the ground quite red, as if it had been ploughed. The cattle continue healthy.

LOCHBROOM.—We had every kind of weather but rain; in that respect it was a decidedly dry month; the heat at times was intense, yet on the 15th, 16th, and 17th it was bitterly cold, with hail and sleet below, and the hills covered with fresh snow to their base, yet, immediately after, we had scorching weather; the brooks and rivulets were never known to continue so long waterless—but welcome rain came at last.

SANDWICK.—June has been warm, dry, and bright; the last ten days were particularly warm. Wind 35 miles an hour on the 21st from midnight to 2 a.m.; several peals of thunder on the 27th and 30th.

IRELAND.

MONKSTOWN.—Much rain till the 21st, after which it was fine, and very much warmer. Crops good but not forward; hay generally a very heavy crop.

DOO CASTLE.—The rain came down in torrents at the beginning of the month, whereby vegetation was greatly promoted; turnips that had been sown since the 20th of May, and for more than a fortnight "made no sign," suddenly sprang into existence, contrary to all expectations. Tremendous hailstorm on the 16th;

as far as I could ascertain, it was about a mile in breadth, and by the extent of the devastation it committed on the potatoe crops, &c., I traced it over 7 miles in length, and I doubt not it extended farther; birds were also found dead after it. This hailstorm did not come near the gauge. From the 21st to 30th, summer weather; T on 2nd and 12th.

OWENDOON.—Fine growth of grass, but tender plants, strawberries, &c., much retarded by the inclement weather of the first three weeks; on the 30th a tropical growth.

WARINGSTOWN.—Fine, genial month; making up in a great measure for our previously unfavourable spring; the last week was very hot, the intense sunshine raising the temperature of the soil 1 foot below the surface on several days as high as 67½°, or 1½° higher than at any time last year.

LECKPATRICK.—Fine month, the timely rainfall most useful to the crops. Max. 81° on 25th.

MINIMUM THERMOMETER ON GRASS.

Aberdeen, 3rd March, 1866.

MY DEAR SIR,—In your *Monthly Meteorological Magazine* for February, I see a letter on the exposure of the minimum for terrestrial radiation, and some remarks of yours with reference to that letter. I have been very much puzzled as to the best method of exposing the thermometers both for terrestrial and solar radiation, and as to the proper sort of thermometer to use. Hitherto I have used a Negretti and Zambra's maximum of the ordinary form completely exposed, and an ordinary spirit minimum on zinc frame, both with black bulbs. I have not been satisfied with the results. Early in January I procured a Negretti & Zambra's maximum (in vacuo), and one of their clear bulb minimum thermometers, and mounted them beside the other two. I read all four at 9 a.m. The two minimum thermometers "on grass" are less than four inches apart. The black bulb one is four inches from the *ground* (not the grass), and the clear bulb two inches from the ground. Therefore if either has a more advantageous position it is the one with transparent bulb. Instead of sending you the actual readings of each for the 45 days I have had them in operation side by side, I send you herewith the means for each group of 5 days. Except on 3 days the B. B. was always lower than the clear bulb, the greatest difference being on the morning of 1st March, 4°·5; but they had been under snow for nearly 24 hours at that time, the clear bulb being deeper imbedded.

The black bulb minimum thermometer on the grass seems therefore to be on the whole lower than the clear bulb minimum, and probably if I had the bulbs of both at exactly the same distance above the grass, the difference would have been greater.

I am very anxious to get information on the subject of terrestrial and solar radiation, but I have been unable to obtain any clear and intelligible instruction in any accessible books. You refer your readers to Mr. Glaisher's paper in the *Philosophical Transactions*, but what is a provincial to do who cannot procure that book.

I remain, my dear Sir, Yours, &c.,

G. J. SYMONS, ESQ. A. B.

Five day mean results of reading a black bulb minimum on the grass, and a transparent bulb minimum, placed side by side, both corrected for index error.

1866.	Black bulb min.	Clear bulb min.	Difference.	REMARKS.	
Jan. 16—20	32·24	33·08	0·84		Mean difference, 1·27
,, 21—25	32·02	33·18	1·16		
,, 26—30	32·12	33·78	1·66		
,, 31— 4 Feb.	29·06	30·90	1·84		
Feb. 5— 9	29·18	30·68	1·50		
,, 10—14	24·98	26·22	1·24		
,, 15—19	24·90	24·98	0·08	3 times in this period clear B. above B. B.	
,, 20—24	26·94	28·38	1·44		
,, 25— 1 Mar.	25·02	26·72	1·70	2 days both buried in snow.	

N.B.—B.B. was compared by Mr. Buchan, Secretary of Scottish Meteorological Society, and clear bulb min. by Mr. Glaisher.

Rainfall in each month from January to June, 1866, and comparison of the total fall in the six months, with the average of the corresponding period in the previous six years, 1860-65.

STATIONS.	Jan.	Feb.	Mar.	April.	May.	June.	Total.	Aver.	Diff.
	in.	in.	in.	in.	in.	in.	in.	in.	in.
England & Wales.									
Camden Town	3·90	3·72	1·69	1·76	2·03	3·98	17·08	11·82	+5·26
Linton Park.....	3·83	4·55	2·27	2·09	·81	3·40	16·95	12·26	+4·69
Selborne	6·23	5·47	2·72	2·78	1·56	2·84	21·60	14·80	+6·80
Hitchin.....	3·63	3·28	1·28	1·65	1·04	2·61	13·49	11·14	+2·35
Banbury	2·57	2·30	1·33	1·52	2·17	2·46	12·35	12·38	— ·03
Culford	2·48	3·59	1·30	1·85	1·66	3·42	14·30	10·98	+3·32
Goodamoor	8·44	6·52	4·42	2·98	3·16	2·94	28·46	25·19	+3·27
Barnstaple	5·44	4·56	3·23	1·46	1·05	2·48	18·22	17·32	+ ·90
Taunton	5·15	4·05	3·44	1·91	1·64	·81	17·00	12·93	+4·07
Shrewsbury	2·40	2·18	1·42	·68	1·56	3·64	11·88	11·87	+ ·01
Orleton	3·00	3·02	2·31	1·69	·94	5·79	16·75	14·46	+2·29
Wigston	2·08	2·78	1·27	1·31	1·10	2·41	10·95	11·62	— ·67
W. Retford	1·25	2·25	1·22	1·27	1·07	2·99	10·05	10·05	·00
Derby	1·60	2·25	1·72	1·04	1·75	4·11	12·47	11·99	+ ·48
Manchester	3·25	2·98	2·17	·30	1·54	3·98	14·22	14·91	— ·69
York	1·64	2·50	1·35	1·05	·58	2·57	9·69	10·10	— ·41
Arncliffe	10·11	9·15	3·60	2·01	1·92	3·46	30·25	24·61	+5·64
N. Shields..... ..	1·51	1·78	2·47	1·47	1·14	1·68	10·05	12·68	—2·63
Seathwaite	25·99	19·17	13·05	5·97	5·06	6·57	75·81	68·09	+7·72
Haverfordwest	7·90	5·41	5·39	2·21	1·36	3·97	26·24	19·60	+6·64
Cefnfaes.....	7·42	6·03	3·93	1·33	1·18	3·87	23·76	20·07	+3·69
Average							19·59	17·09	+2·50
Scotland.									
Dumfries	5·56	3·00	2·03	·96	1·41	1·84	14·80	17·09	—2·29
Auchendrane	8·30	5·30	2·13	·77	1·94	2·17	20·61	20·29	+ ·32
Otter House	10·89	7·41	4·43	2·30	1·66	3·14	29·83	25·59	+4·24
Nookton	2·80	4·10	2·02	1·45	1·50	1·35	13·22	12·13	+1·09
Deanston	6·96	5·91	2·75	2·11	1·11	2·58	21·42	18·56	+2·86
Portree	19·17	10·90	6·40	3·80	1·95	2·78	45·00	48·05	—3·05
Sandwick	4·33	5·63	3·08	1·21	2·15	1·87	18·27	14·64	+3·63
Average							23·31	22·34	+ ·97
Ireland.									
Waterford.....	5·42	2·70	3·51	2·41	1·28	3·91	19·23	17·25	+1·98
Killaloe.....	6·63	5·51	3·85	2·05	3·06	4·48	25·58	21·02	+4·56
Portarlington	3·72	2·99	2·92	1·64	1·19	3·73	16·19	17·82	—1·63
Monkstown	2·59	2·30	4·15	2·11	1·58	3·73	16·46	13·77	+2·69
Average							19·37	17·47	+1·90

From the above table the following facts are evident:—

(1) In England and Wales the fall has been about 2½ in. above the average, say 15 per cent. in excess.

(2) In Scotland the fall has been about 1 in. above the average, say 4 per cent. in excess.

(3) In Ireland the fall seems to have been about 2 in. above the average, say 11 per cent. in excess.

(4) Speaking roundly, the rainfall of the past six months has been about one tenth part greater than usual; but in Middlesex, Kent, and Hampshire it has been nearly half as much again as usual—42 per cent. in excess,

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

VII.] AUGUST, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

STORMS OF JUNE 27TH.

HAVING reported so fully on these storms in our last number, we cannot allow them more space save by way of correction and elucidation. To the report from Whetstone we added (p. 47) a protest, which is confirmed by the following note :—

WHETSTONE.—"I am obliged to you for the copy of your journal ; and beg to say, with sorrow, that I made a most unaccountable mistake in saying that the body of cloud moved E., when the fact was it moved W. The mistake was very foolish on my part, and the only reparation I can make is to acknowledge it promptly."

Thus the details of the Cricklewood storm are *all* reconciled, and *it* may be as considered settled. The Hampton Court storm is involved in some uncertainty; our able correspondent at Gomer House is unshaken in his opinion that it passed over him from E. to W., and most unfortunately no one appears to have noticed the aspect of the broken windows at neighbouring places ; perhaps this will remind readers, that in case of hailstorms, the direction is best shown by broken windows, just as the direction of gales is shewn by prostrate trees.

STORM ON THE COTSWOLDS.

On the night of 27th, the Cotswold Hills and the adjoining valley of the White Horse were visited by a tempest of extraordinary severity and duration. Until five o'clock in the afternoon no indication had presented itself of the coming storm, but shortly afterwards the light and fleecy clouds, erratic in their motion, significant of atmospheric disturbances, were rapidly succeeded by densely black volumes, which almost without notice commenced a conflict of terrible and sublime grandeur. The storm seems to have culminated in the Bourne, near Northleach. At Foss Bridge Inn, the flood was so great that it flowed into the house and attained a depth reaching to the window sills of the general apartments, while in the cellar it acquired a depth of five feet. The church of the village was surrounded by water exceeding three feet in depth, while the roads in places were burst, and the walls thrown down. On the same afternoon at Shaftesbury, a heavy thunderstorm, which lasted upwards of an hour, was experienced. The lightning was very vivid, with loud peals of thunder, and the rain fell in torrents, stopping the gutters, and in some instances rushing into the dwelling-houses of the inhabitants. At Melbury Abbas the storm was accompanied by hail, which did great damage to windows, and killed some fowls.

Chepstow, July 18th, 1866.

MY DEAR SIR,—As I find from the report in the "Meteorological" that the thunderstorms of the 27th ultimo were more general and peculiar than I had supposed, I send some particulars of the passage of one over this neighbourhood, which may be acceptable, inasmuch as you have none from any place nearer this than Newport.

The first indications were visible in the direction of Newport at 5.30 p.m. ; the first thunder heard at 5.50, at which time the telegraph operator at the Railway Station informed me he had received some severe shocks, due to the electrical state of the wires. At this time, as I afterwards heard, the storm was raging severely in the low grounds between Newport and this, especially at Caerwent

(5 miles distant), where the hailstones were larger than ordinary filberts. From that point the northern boundary of the storm was bent in an E. direction (the line from Newport to Caerwent being N.E. 8½ miles) and just touching the point of land at the junction of the Wye and Severn, (5 miles) it again took a N.E. direction, crossing the Severn at a slight inclination, and reaching the Stroud valley (through which the Great Western runs to Swindon) 19 miles further, at 7.40. This latter information I had from a friend who leaving this at 6 p.m. watched the progress of the storm from the railway on the west bank of the Severn, and met it at the latter point on the east bank. The high lands of the Cotswold range at the head of the valley seem to have terminated the storm in that direction, inasmuch as both the time and direction given by your correspondent at Highworth (Swindon) lead to the inference of a distinct storm. At any rate, the same storm if it began at Cardiff at 4.30 (though your report from Pentyrch infers it came from Neath 35 miles further westward) is thus distinctly traced for at least 53 miles.

During the passage of the storm, 2 miles to the southward of this, the sky was obscured by heavy masses of electrical clouds, but no rain fell, although the view was quite shut off to the southward by the sheets of rain which deluged that part. At 7.10, however, a heavy cloud *returned from the east*, and from this we had a few large drops, about one to each superficial foot, but no more during the night, the minimum temperature of which was 60°. At Gloucester no rain fell, but at 9 p.m. lightning was seen in the direction of the Malvern hills. I hope some of your observers will be able to trace a similarly defined line for the southern boundary of this remarkable storm.

Your's very truly,
JAMES G. WOOD.

P.S.—As regards the startling account of ice at Newport, on which you have a note (p. 52), it is quite possible that the pieces had frozen together *after* they had fallen.

J. G. W.

SIMPLE BAROMETRIC FORMULÆ.

A Simple Rule for Mentally Determining Differences of Height by the Barometer.

To the Editor of the Meteorological Magazine.

Sir,—For rough work like that described by your correspondent, "A Lazy Man," last month, it will be sufficient in all cases where the reading at the higher station does not fall under 28 inches, to multiply the difference of the readings in hundreths of an inch by 9, or if much lower, by 9½. This will not, perhaps, give a very accurate result, but it will be nearer than that indicated, and has the advantage of being easily remembered. For instance, suppose the reading at the bottom of the mountain to be 30, and at the top 28 inches. 200 hundredths multiplied by 9, will give 1800 feet, about 13 feet less than the truth. The rule might easily be made more precise, but it would involve a little calculation and a little effort of memory, which would be too great a task on the energies of "A Lazy Man."

Higher readings require a somewhat lower, and lower readings a somewhat higher multiplier. No correction for temperature is required for the aneroid. With Negretti and Zambra's pocket barometer, a useful table of differences is given, and I have constructed a little scale which I keep in my pocket-book and which answers every useful purpose. Of course this scale finds much more accurate results than the rough rule given above.

If not too much trouble, the reading at the bottom should be noted both before and after the ascent, the mean to be taken as the real observation.

Yours truly,

Barlastone, July, 10th, 1866. W. S.

Dear Sir,—If you think it worth while to publish anything more on the subject of *exact* and *easy* barometric altitude tables, I beg to submit to you a table which I have arranged and computed for my own use, and which I believe possesses considerable advantages over all others known to me.

English mountaineering is performed much more frequently under a temperature of 62°, than at 32°. These tables are computed for temp. 62°, and therefore will

need no correction at all in 9 cases out of 10 when most other tables are most at fault unless that correction is applied.

When the temp. is much above or below 62°, the alteration of the readings of the Bar. at the rate of 1 inch for 15° or ·2 for 3° is so very simple and easy, as in my opinion to distance all competition. The whole business is, therefore, reduced to three very easy operations: (1.) Correcting bar. readings for temp. of air. (2.) Interpolation between the terms in the table. (3.) Subtraction.

There is no multiplication, no division.

I will work out your own example.

Reading	29·890	26·656
62°—50°=12°	+ ·800	+ ·800
Corrected reading	30·690	27·456
Tabular Numbers	4633	1522
Difference	3111 = height in feet.	

I am, Sir, yours faithfully,

Milland, Liphook, 27th July. J. M. HEATH.

COMPANION TO THE ANEROID, OR MOUNTAIN BAROMETER.

RULE.—When the temp. of the day is $\begin{matrix}\text{less}\\\text{greater}\end{matrix}$ than 62°, $\begin{matrix}\text{increase}\\\text{diminish}\end{matrix}$ *both* the readings of the Bar. at the rate of 1 in. for every 15° of temp. below 62°, or 0·2 in. for every 3°. The difference of the tabular numbers opposite these corrected readings is the true vertical altitude.

Bar.	Vert. Alt.	Bar.	Vert. Alt.	Bar.	Vert. Alt.
	90		96		102
30·9	4824	28·9	2955	27·3	1363
	91		97		103
30·5	4460	28·7	2761	27·0	1054
	92		98		104
30·2	4184	28·4	2467	26·7	742
	93		99		105
29·9	3905	28·1	2170	26·5	532
	94		100		106
29·6	3623	27·8	1870	26·2	214
	95		101		107
29·2	3243	27·5	1567	26·0	0

RADIATION THERMOMETERS.

DEAR SIR,—There is a very interesting letter from "A. B." in this month's *Meteorological Magazine*, on the "Grass Minimum". I cannot understand why the thermometer should be *raised above the ground*; for it seems to me, that it is the upper surface of the earth that is most cooled by radiation, and that the lower stratum of air of 4 or 5 inches thickness is only cooled by contact with the earth and grass.

The extra fall of the blackened minimum is probably due to the radiation of the bulb itself, black surfaces radiating better than any other.

The registration of the minimum upon grass is not of any scientific use, as it is impossible to compare observations made at different places, and for other reasons; but to farmers, gardeners, and others, is doubtless of great importance.

I would caution some of your readers about "Solar Maximum Thermometers in vacuo". In some of these instruments by the first makers a thin cloudiness sometimes appears on the inner surface of the exhausted globe, which is next the sun, caused by an exceedingly small amount of water vapour being left in it. Any one possessing such an instrument should request the maker to change it, as its indications are worse than useless. I am, dear Sir, yours very truly,

G. L. T.

RAINFALL IN JULY, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft.	in.	feet.	inches	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	1·19	— ·76	·24	28	11
II.		Staplehurst (Linton Park)	0	6	200 ?	2·73	+ ·75	·71	6	10
,,		Selborne (The Wakes)	4	0	500 ?	1·38	— ·83	·36	3	8
III.		Hitchen	2	0	240	...	...	...	...	...
,,		Banbury	7	0	345	2·08	+ ·02	·91	28	12
,,		Wisbech	0	6	10	3·02	...	1·11	29	14
IV.		Bury St. Edmunds (Culford)	1	2	...	2·25	+ ·27	·50	1	11
V.		Calne	0	11	250	1·52	...	·50	2	9
,,		Plymouth (Goodamoor)	0	2	580	2·42	—1·86	·66	6	11
,,		Barnstaple	0	6	31	2·60	— ·26	·74	5	11
,,		Taunton (Fulland's School)	1	4	...	1·79	— ·28	·47	3	12
VI.		Shrewsbury (Highfield)	5	6	200	1·61	— ·46	·66	29	5
,,		Tenbury (Orleton)	0	9	200	2·17	— ·22	·52	7	13
VII.		Leicester (Wigston)	0	6	220	2·21	+ ·11	1·02	29	10
,,		West Retford	0	6	50	2·70	+ ·64	·74	28	15
,,		Derby	5	0	180	2·41	— ·22	1·57	29	13
VIII.		Manchester	2	7	106	4·31	+1·71	1·99	28	13
IX.		York	0	6	50	2·91	+ ·97	1·22	29	9
,,		Skipton (Arncliffe)	3	0	750	5·24	+2·01	1·20	28	12
X.		North Shields	1	0	124	3·70	+1·89	1·46	30	9
,,		Borrowdale (Seathwaite)	1	0	422	11·18	+3·04	1·77	5 & 9	16
XI.	WALES.	Abercarn	1	3	450	1·62	...	·59	1	8
,,		Haverfordwest	2	0	60	1·55	—1·74	·35	9	12
,,		Rhayader (Cefnfaes)	2	0	880	2·41	— ·44	·60	2	10
,,		Llanberis (R. Victoria Hotel)	1	0	370	1·41	...	·34	8	8
XII.	SCOTLAND.	Dumfries	0	5	70	2·84	+ ·60	1·01	29	12
,,		Hawick (Silverbut Hall)	4	0	512	3·87	...	1·25	4	13
XIV.		Ayr (Auchendrane House)	2	3	94	3·32	+1·16	1·44	28	13
XV.		Otter House	0	6	130	3·38	+ ·07	·66	30	17
XVI.		Leven (Nookton)	0	6	80	2·87	+ ·60	·72	28	14
,,		Stirling (Deanston)	0	0	130	3·27	— ·13	·98	28	17
,,		Logierait	1	0	250	3·16	...	1·45	29	11
XVII.		Ballater	0	10	656	2·58	...	·81	28	14
,,		Aberdeen	4	8	115	3·49	...	·66	29	19
XVIII		Inverness (Culloden)	3	0	104	3·07	...	·96	30	12
,,		Fort William	0	8	20	3·27	...	·60	8	17
,,		Portree	0	4	60	3·90	—2·17	·84	2	15
,,		Loch Broom	0	8	48	1·91	...	·36	4	14
XIX.		Helmsdale	1	0	34	1·50	...	·25	9	14
,,		Sandwick	2	0	78	1·64	— ·25	·68	2	8
XX.	IRELAND.	Cork	6	0	65	·44	...	·18	5	8
,,		Waterford	4	0	60	·85	—2·46	·28	4	8
,,		Killaloe	5	0	128	1·96	—1·23	·49	2	14
XXI.		Portarlington	9	0	236	1·22	—2·32	·36	6	14
,,		Monkstown	0	6	100	·89	—1·54	·22	3	13
XXII.		Galway	6	0	25	1·94	...	·35	13	15
,,		Bunninadden (Doo Castle)	1	0	...	2·04	...	·47	13	15
XXIII		Bawnboy (Owendoon)	1	3	218 ?	2·66	...	·63	13	17
,,		Waringstown	0	4	191	2·98	...	·70	29	14
,,		Strabane (Leckpatrick)	0	5	260	1·96	...	·54	28	12

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain.

ENGLAND.

CAMDEN TOWN.—A fine month, showers in the first and last weeks. Hot from 9th to 21st, but rest of the month cool, some nights chilly. T S on 4th 3 p.m. and 6th 6·30 p.m.

LINTON PARK.—Frequent heavy showers every day for the first week, afterwards hot, dry, and fine to the 28th; the last four days showery; T on 1st, 6th, and 29th; the hottest days were the 12th, 14th, and 15th. Some corn cut at the end of the month, but harvest not general, the second and third weeks being fine, favoured the getting up of the hay, which, though late, has been a better crop than for some years. The prevailing winds have been W.S.W., with often sudden changes without affecting the general character of the weather. Fog on mornings of 21st and 23rd.

SELBORNE.—T on 1st, 2nd, 5th, and 6th; on 15th at 4 p.m., and on 16th at 2 p.m., distant T was heard. High winds on 9th and 10th. Max. 80° on 12th. Prevailing winds S.W. early in the month, latter part N.W.

BANBURY.—Heavy showers with hail and T on 1st, 5th, and 6th. Max. 83° on 12th. Hay-making very nearly completed at the end of the month, crop heavy.

WISBECH.—T S with hail at noon on 1st. T S at 2 p.m. on 5th, heavy rain from 3 to 4 a.m. on 29th, total fall during the 24 hours 1·11. Max. 89°·4 on 13th. Fog on morning of 21st.

CULFORD.—T on 1st. Max. 88° on 13th. Mean temp. of this month is rather less than that of the preceding (June) being 61°·2 to 62°·8. Wheat harvest commenced in this neighbourhood on the 19th, but has not become quite general yet, the last five days of the month having been more or less rainy.

GOODAMOOR.—A beautiful month, but remarkable in this part for the absence of T SS, not a flash of L have I seen. Max. 84°. The rainfall of the first 8 days and the great heat after did wonders in forcing on vegetation.

HIGHFIELD, SHREWSBURY.—Max. 87° on 12th.

ORLETON.—Heavy R followed by T and L at 11.16 a.m. and 4 p.m. on the 6th. The first week cold and showery; very fine from the 8th to the 26th, without any R, and occasionally very hot; cold and stormy thence to the end of the month. Temperature very variable, but a little above the average. Max. 84°·2 on 12th; hazy for many days.

WIGSTON.—The range of the max. ther. during the month has been greater than I have ever known; on the 12th the reading was 92°·5 and on 31st only 57°·0, the heat of the 12th was 3° more than I have ever recorded; this district has suffered more from drought than almost any other, consequently the ripening of the corn has been more rapid. Wheat being ripe and reaping commenced on the 30th.

W. RETFORD.—It is with deep regret we announce the death of the able observer at this station—(The Rev. C. D. Butterfield).

DERBY.—July commenced and ended wet, the intermediate period being dry and unusually hot, allowing the great bulk of hay in this neighbourhood to be led in excellent condition. An earnest and steady R commenced on Saturday night (29th) and continued till 7.50 on Sunday morning (30th), 1·57 in. having fallen in the 24 hours; the Derwent has filled its banks, and another half inch of R would flood the low lands, but as the bar. is rising and the wind N. probably the weather will improve.

ARNCLIFFE.—From 10th to 26th beautiful weather, cold towards the end of the month. Max. 90° in shade.

NORTH SHIELDS.—T S on 13th; fine dry month till the 28th, on the evening of which day R began to fall heavily, it continued through the 29th; the morning of 30th was fine, but at 5 o'clock it again began to R; during the night 1·46 in. was measured; wind N.E. and a heavy storm.

SEATHWAITE.—Splendid weather from the 15th to 27th; Max. (at Tarnbank) 79°·4. Five days on which the R exceeded 1 in.

WALES.

ABERCARN.—A dry warm month, with 14 cloudless days.

HAVERFORDWEST.—July commenced with high winds, R, and a low temp. seldom reaching 60°; thence to the 27th, the temp. was above the average for this locality, exceeding 70° on many days; the latter part of the month was very close and sultry, with a damp foggy atmosphere, rendering it very unhealthy and oppressive, the last three days were fine and fresh; wind very boisterous from the N. with a considerable fall in the temp. No T during the month. The prospects of the harvest are generally favourable.

CEFNFAES.—Slight T S on 27th; thick haze on the hills from 23rd to 26th; month generally dry and hot. Max. 88° on 15th.

SCOTLAND.

DUMFRIES.—First nine days showery; from 10th to 26th, weather hot and scorching, pastures dried up and withered by the drought, streams very low, fine weather for haymaking. Max. on 12th 88°; at the close of the month, four days wet, rainfall on 29th very heavy (1·01 in.) R of immense benefit to pastures and turnip crop; harvest commenced with cutting barley on 30th, and will be general after the 6th of August. Wheat is a good crop, oats are light and below the average, potatoes are very good.

SILVERBUT HALL.—Heavy fall of R on the 4th, half-an-inch falling between 10 and 12 a.m., severe T S on the 13th, L of the forked and ball kind, very vivid and T very loud, the month taken as a whole may be said to have been a favourable one for gardeners and husbandmen.

AUCHENDRANE.—On 2nd at 11 a.m. a very heavy shower of H, which for a time made the ground appear white; on 1st and 5th slight T S at a distance, (the only T of the month), the severe T S S which prevailed on the 16th over the E. and S.E. of Scotland (between the Grampians and Roxburghshire) did not reach here, the day, though sultry with dense and heavy clouds, being fine. On the 28th 1·44 in. of R fell, which slightly, and only for a short time, increased the water in the rivers which had been, and continued very small during the month.

OTTER HOUSE.—Little or no R from the 11th to the 29th, the R above the average; colder than June, but favourable to the crops.

NOOKTON.—The weather warm and fine, changing with R to a lower temp. on 26th.

DEANSTON.—Only ·46 in. of R fell from the 11th to the 26th; distant T in the N. on the 4th, and in the E. on 13th. Max. 81° on 4th.

LOGIERAIT.—Very hot from 4th to 27th; a very severe T S on 15th, several slight accidents from the L; first T at 3 p.m., between 5 and 6 the L was very vivid and the roll of the T almost incessant, storm ceased at 6.30. Hay not a heavy crop, but secured in fine condition. Pastures suffering from drought, and harvest prospects not very good. Max. 83° on 12th.

BALLATER.—Some very warm weather in the early part of the month, ther. in shade on 12th being 86°·6; on the 13th a severe T S in the afternoon from S.W. to N.E.; from 5 to 6.30 p.m., the L was very vivid and continuous, and T tremendous, H and R accompanied the storm but no damage was done; from the 15th to 26th, dry, easterly winds caused the crops to suffer, but from the 26th to the end more than 1·50 in. of R fell. Haze on the 13th, and on the hills on 25th.

ABERDEEN.—T on 1st, 2nd, 3rd, 4th, 5th, and 13th; fog on 13th, 29th and 30th. Max. 78°·2 on 11th. Rain and wind rather above the average of last 10 years; temp. rather below it.

FORT WILLIAM.—On the whole the month has been a very pleasant one; less R has fallen than is usual at this season of the year, and water for domestic purposes has been scarce; the formation of the country is such that much moisture is required. In July last year nearly 2 in. more R fell than this year.

PORTREE, ISLE OF SKYE.—Very fine weather, crops of all kinds looking well; potatoes of excellent quality and very abundant, no appearance of blight at present; there has not been such a long dry time in this island in the memory of the oldest individual as there has been this summer. Water supply very scarce, many of the springs being dried up. No storms of any kind during the month.

LOCH BROOM.—A remarkably dry month; were it not for the copious dews at

night the consequences would have been serious; the cereals though short will be more than compensated by the luxuriance of the turnip and potatoe crops; our running streams do not show any increase, and the ordinary brooks are still dry, an occasional shower does not appear to have any effect upon them. On the 13th we were visited from 3 to 8 p.m. by the most terrific T S we ever remember, the L was vivid and almost incessant, while the T was awfully near, the amount of R accompanying this storm was wonderfully small.

HELMSDALE.—The heaviest T S that has visited this country for many years passed over this district on 16th, from S.E. to N.W., the L was very vivid and beautiful, the storm continued almost without intermission from 3 p.m. on 16th to 1 a.m. on 17th, but the amount of R that fell was very small.

SANDWICK.—Four peals of T with heavy H on 2nd; severe T S from about 3 to 6 a.m. on 14th, which passed a little to the eastward of this place. Stratus filling the valley on morning of 31st, and Aurora at night.

IRELAND.

KILLALOE.—Max. 83°·5 on 12th.

MONKSTOWN.—A very dry month, scarce *any* R from the 5th to the 27th. Millers complaining of want of water in the streams and rivers. The crops all look remarkably well, the hay well saved, in most places it is a very plentiful crop. Some days were warm but only nine above 70°. Max. 78° on 10th. On the 31st the mountains in Co. Down, about 60 miles distant, were perfectly clear down to their very bases, this extreme clearness was succeeded by very heavy R on 1st August.

DOO CASTLE.—Wet till the 8th, from which to 25th no R fell, save ·47 in. on the 13th. Remainder of month more or less wet, 16 days of this month were delightful. Fog on morning of 11th. No T or L.

OWENDOON.—This has been a most favourable month, and all crops are looking very well. Hazy on 27th.

WARINGSTOWN.—Fine seasonable weather throughout. All crops looking unusually well, but somewhat late.

LECKPATRICK.—Fine, no R for a fortnight in the middle of the month. Max. 81°·4 on 12th. R at the end of the month came in very usefully for the crops.

DISCOLORATION OF PAINT BY RAIN.

Trinity College, Dublin, July 2nd, 1866.

MY DEAR SIR,—Aware as I am of the deep interest you take in everything connected with Meteorology. I think the following may not be unacceptable to you.

For some time past I have noticed on walking through the city during the prevalence of rain, that certain hall doors appeared *stained* wherever a drop of rain had fallen on them.

This effect lasted for some considerable time after the rain drops had evaporated. So far as I have been able to ascertain, but one description of paint undergoes this strange transformation, viz., a *dark green.* Also, this curious effect is but seldom observable, perhaps on not more than eight or ten days in an entire year. From inquiry and from observation I have arrived at the following facts.

First, as regards the composition of the paint, which seems most influenced, it is

Dark Brunswick Green (*i.e.* "Muriate of Copper.")
Lampblack.
English Umber (*i.e.* an ore of iron and manganese)
"*Patent driers*" (a mixture of whiting, Ca O, Co_2, and Zu O, So_3.)

Secondly, as regards the occasions on which this phenomenon is usually observed.

Heavy rain, and high wind, resulting from a *union* of S.W. and N.E. currents, the barometer being generally very low, the wind strong from S.E. or S., and a large *per centage of ozone* being frequently noticed. Probably we may have in this phenomenon a ready test for ozone, or it may be that *ammonia* gives origin to the stains left by the rain drops.

If you think it worth while, you might kindly lay these facts before the readers of the "*Meteorological Magazine.*" Yours very truly,

JOHN WILLIAM MOORE, B.A., SCH. T.C.D.

P.S.—The stain is of a *slate-blue* colour. The last day I noticed the effect was the 18th of June, when the state of the weather was as follows:—

Very wet, 1·163 in. of rain in 24 hours, wind E.S.E., upper current from S.W.

to S. Barometer 29·46, and thermometer but 48°, the wind also was very high, *ozone* 100 per cent. at the Ordnance Survey, Phœnix Park.

As it seemed desirable to solve the problem as soon as practicable the above letter was submitted for report, and the following note received:—

DEAR MR. SYMONS,—I have read over Mr. Moore's communication to you which you placed in my hands. I fear, however, that without personal inspection of the phenomenon he describes, I can offer little else than plausible guesses.

It is very common with painters to cover a surface with ultramarine before putting on Brunswick green, and to lay on the latter pigment only in a comparatively thin coating. After the oil used for mixing has become oxidised and dry (and this happens very soon when "turpentine substitute" has been added in large quantity) the two layers are in close contact; and water by rendering the outer thin layer more transparent, might cause the ultramarine to show underneath.

The only source of ammonia in the rain which I can imagine at the present moment, is the vapour from gas-liquor. If the liquor were being collected into casks at the gas-works for sale, and the wind was blowing from S.E. at the time, this might *possibly* account for the slate-blue appearance. Such a supposition is, however, very unlikely.

Ozone can have nothing to do with the matter. There is no good evidence that ozone ever occurs in air.

I would advise your correspondent to apply to one of the resident teachers of chemistry in Dublin; the question would probably be settled immediately.

I am, yours very truly,

University College, London. EDMUND J. MILLS, D.Sc. F.C.S.

A NEW ENEMY TO RAIN GAUGES.

MY DEAR SIR,—I have just encountered a new enemy to rain gauges, which had I not discovered it in time, or had I not kept several gauges of different sizes, heights, &c., might have caused me considerable annoyance. On looking into the receiver of my Apps' gauge (5 in.), I detected a small leaf, and, supposing it to have been blown in by the wind, proceeded to remove it, when I saw several more equally small, and some fragments. On carefully examining these leaves and fragments, I discovered that the pipe of the receiver of the gauge was completely filled up with nine nests of one of the genus Megachile, or leaf-cutter bee. I had great difficulty in removing them, so beautifully were they fitted and soldered as it were to the tube. To prevent the recurrence of this, I have fastened a little cap over the aperture of the pipe, leaving just sufficient space to allow the rain to trickle through freely, but small enough to exclude a similar invader on any future occasion. Thinking you might like to notice this in the next number of your *Meteorological Magazine*, I send you this account. Yours always, very truly,

Strathfield Turgiss Rectory, July 20th. C. H. GRIFFITH.

THE TRUE HISTORY OF A THUNDERBOLT.

ON July 2nd one of the London daily papers startled some of its readers by inserting a letter on the thunderstorm of June 30th, in which the writer said, "At six o'clock it broke out again with increased violence, the rain descending in torrents, and at a few minutes past seven a thunderbolt fell in the gutter opposite my house (in Westbourne Park, Notting Hill,) and was smashed to pieces, one of which I have at the hour at which I write. Numbers of persons are still searching for the fragments."

Feeling certain that there was a weak point somewhere, inasmuch as "thunderbolts" have no existence, we called on the writer of the letter and other residents, found the story amply confirmed, received several pieces of the "thunderbolt" (by the bye, some were sold at 10/- and 15/- each), and eventually ascertained that one of the pupils of an analytical chemist had availed himself of his tutor's absence to fill a capsule with materials calculated to burn vigorously, and explode in heavy rain, and, during the height of the storm, had thrown the burning mass into the gutter, so making an artificial thunderbolt. It is no wonder that the neighbours were taken in by a trick so well-arranged.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

VIII.] SEPTEMBER, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

THE METEOROLOGICAL DEPARTMENT OF THE BOARD OF TRADE.

THE appointment of chief of the above office could scarcely be a sinecure in a country like this, where ceaseless alternations require attention, and where so many fancy they possess the key of nature's secrets, and can tell whence the wind cometh and whither it goeth. Admiral FitzRoy, however, took such unusual steps to bring his work before the public that it is no wonder that during the ten years in which he presided over the Department constant criticism was his lot; and that with his total lack of management, all his energy, experience, self-devotion, and zeal, were inadequate to cope with the pressure of work necessarily incidental to the position he held. However, the good old Admiral is gone, and we can only repeat the sentiment of one of the leading journals—"He is gone to his rest, and many a storm-sheltered mariner will look to the signal drum, and grieve with a manly sorrow for the loss of Robert FitzRoy."

Shortly after his death, a letter was addressed by the Board of Trade to the President of the Royal Society asking the advice of the Royal Society—(1) As to the extent to which the Department had fulfilled the objects for which it was organized; (2) As to the reliability of forecasts and storm signals; (3) As to the future conduct of the Department. About a month afterwards (June 15th, 1865), General Sabine, on behalf of the Royal Society, replied—that they considered the evidence submitted to them justified their recommending that the forecasting should remain in the hands of Mr. Babington, by whom it had been virtually carried on for some months past; that the meteorological observations made at sea by the captains of the royal and merchant navies be transferred to the custody of the Hydrographer, with a view to the introduction of the results into the Admiralty Charts; and lastly, that an entirely new system be organized for observing the "Land Meteorology of the British Islands," the stations being not less than six* in number, and provided with self-recording apparatus, the records from which should be sent weekly or otherwise to Kew Observatory, which is hereby proposed as the centre of this system. The Board of Trade subsequently expressed a desire for more thorough consideration of the progress made in marine meteorology, suggested the appointment of a small committee of investigation, and intimated that they saw some difficulty in the proposed maintenance of two establishments, one at Whitehall and one at Kew. Eventually, the

* Falmouth, Kew, Stonyhurst, Armagh, Glasgow, and Aberdeen, are proposed.

following three gentlemen were appointed (in November, 1865) a committee of investigation:—

Royal Society—FRANCIS GALTON, Esq., F.R.S., General Secretary of the British Association.

Admiralty—STAFF-COMMANDER EVANS, R.N., F.R.S., Chief Naval Assistant to the Hydrographer.

Board of Trade—T. H. FARRER, Esq., one of the Secretaries to the Board of Trade.

Their report was presented to Parliament last session, and proves three points at once—first, the desirability of such a thorough investigation, the efficacy of the committee proposed by the Board of Trade, and the ability (if that wanted proving) of the persons nominated. It is rather voluminous (81 pages folio), and so replete with facts and details of importance as to render it extremely difficult to present an abridgment doing it full justice. After giving a clear and succinct account of the origin and original functions of the Department, it notices the steps taken to obtain meteorological observations at sea, and their results; also the method adopted by the Department in extracting observations, which comes in for detailed criticism of an exhaustive character, and a plan for future use is suggested of considerable value, and which we will therefore explain rather fully. Of course the essential difference between the meteorological register of a ship, and an observatory, is that the place of observation is movable in one case and fixed in the other. This difficulty is obviated by portioning out the ocean into squares embracing 10° of latitude and 10° of longitude—of course, therefore, of variable real area, but still readily recognized divisions. The old plan was to have "Data Books" for each subject, paged to correspond with the squares just referred to; then if the Department were working up any subject, the ships' registers were searched for that one detail only, and the rest was left uncopied; thus at least eight or ten separate searches were made, involving quite fourfold the trouble of the plan now proposed, which is, that each register should be copied out at once on to a set of printed cards, which could then be searched, sub-divided to any extent, and available in any way. We have seldom seen a more sensible or useful suggestion. The Committee proceed to enumerate and comment on the publications of the Department, which as a rule are condemned for their want of method. Among their suggestions for future practice is that of a form (Appendix p. xviii.) in which certain observations might be tabulated for publication, which is either an absurdly complicated misprint, or it requires explanation. The year is divided into four quarters, as follows:—(1) December, January, February; (2) March, April, June; (3) July, August, September; (4) August, November, December. May and October are therefore omitted, and August and December mentioned twice. We cannot comprehend this at all.

We have already remarked that the Board of Trade suggested a possible difficulty by the maintenance of a duplicate establishment at Kew; a paragraph, however, on p. 17 of the report under notice shows a third branch of the Meteorological Department:—

"The Admiralty Hydrographic Department are now devoting considerable pains to the preparation of physical charts—such as Ice, General Ocean Currents, and

Wind Charts. In these it is proposed to embody the results collected by the Meteorological Department in a form available to seamen."

The second part of the report is occupied by an account of the origin, and a rigorous examination of the Forecasts and Storm Warnings issued by the Department; it is far too voluminous for extract, but the following are the conclusions arrived at by the Committee:—

"(1) That the maxims on which the Department acts in foretelling weather have not been reduced into any clear or systematic form, and are not shown to have been established by sufficient induction from observed facts.

"(2) That as a matter of fact the Daily Forecasts are not shown to be correct, and that they are not in our opinion useful.

"(3) That the Storm Warnings, so far as they indicate the force of coming gales, have been sufficiently correct to be of some use, and that their utility is widely admitted. Also, that they have improved, and that they are probably capable of still greater improvement.

"(4) That the Storm Warnings, so far as they indicate the direction as well as force of coming gales, are not shown to have been so far precise or correct as to be of use."

After mentioning the benefit conferred by the erection by the Department of 95 good barometers at some of the poorest of the fishing villages, the report notices and approves the suggestion of the Royal Society as to the establishment of the six stations with self-recording instruments already referred to, proposes that they be supplemented by about sixty secondary stations, lighthouses, &c., and that the returns thus obtained should be laid down on maps similar to those of M. Le Verrier, and published at a low price. They insist on the officer issuing a storm signal "noting down at the time, and reducing into exact shape afterwards, the maxims or principles which have guided him in making the Signal of Force, or Prediction of Direction; the facts to which those maxims are applied; the mode in which he has applied or combined them, the value he has attached to each of them, and the value of the probability he has thus obtained, and which is indicated by the signal or prediction"; they also propose that a rigorous check on the signals be kept by collating all available records with the predictions.

They further propose that the collection of ocean statistics should continue much as it was originally arranged by Admiral FitzRoy, but that the discussion of the results should be on the improved plan already explained; that additional buildings be erected at Kew, and the branch department there should be under the control of a scientific body receiving a grant of about £7000 per annum from Government, and out of it defraying all expenses incidental to the thorough and systematic collection of weather statistics of the British Isles, and the maintenance of the system of storm warnings. As far as we can see, the estimated expense of the Kew and Board of Trade Meteorological Departments would be about £15,000 per annum, to which must be added the expenses incurred at the Hydrographic Department in getting out and publishing charts. The report goes on to express the hope that at no distant day one international centre may be established, and thus all divided and therefore duplicate labour be avoided; and concludes with the following paragraph:—

"We feel, moreover, that we should be doing great injustice to ourselves if we were to allow it to be supposed that we undervalue either what the late Admiral

FitzRoy attempted or what he effected. To his zeal and perseverance is due the credit of establishing a system of Storm Warnings, which is already highly prized by the seafaring class. And if a more scientific method should hereafter succeed in placing the practice of foretelling weather on a clear and certain basis, it will not be forgotten that it was Admiral FitzRoy who gave the first impulse to this branch of inquiry, who induced men of science and the public to take interest in it, and who sacrificed his life to the cause."

FLOODS IN THE NORTH RIDING OF YORKSHIRE.

DESTRUCTION OF A RAILWAY BRIDGE.

MALTON, *Thursday, Aug. 30th.*

THE continuous rains of Wednesday have (for the second time this summer) caused great districts of the North Riding valleys to be inundated, causing a destruction of farm property, from which the county has not suffered since 1857, when a similar flood occurred. The late rainy season has so saturated the land that the whole of the last extraordinary rainfall ran rapidly off into the streams, and in that short period the North Riding rivers have risen from summer level to a state of flood. So heavy was the rain of Wednesday that the return railway journey from the Whitby Agricultural Show to Malton was made through an infinite array of cascades, every glen of the romantic Newton Dale being overcharged with water from countless contributory streamlets. On the eastern side of the moors the waters drain to the sea by the Esk—a meandering stream which the Malton and Whitby Railway crosses some dozen times in half-a-dozen miles. This stream receives the drainage of the Ellerbeck and the Gothland valleys, and rose to a state of flood in a few hours. The wooden bridge No. 9, from Whitby, being old, was about to be restored or replaced, and the railway company had commenced operations for a permanent structure. This bridge was watched with some anxiety all last night, the traffic of Wednesday (much of it excursion traffic) having all passed the bridge in safety. During the night, however, the flood literally floated the bridge and had drawn the piles, so that the trains could no longer pass. In Ryedale the rivers have risen rapidly, and above Newsome Bridge have either burst or overflowed the banks. This morning large tracts of country under crop are flooded, and in some places so deeply that the heads of the growing crops are only just above water. Of course all the pastures will again be spoilt for a time by the mud left by the flood water. The old Derwent, with the rapid flow of the moor streams, has again overflowed, and a railway journey to Pickering shows the extensive grazing lands one sheet of water for miles. At noon the waters were still rising, and it was feared the country of the Derwent proper, from Malton downwards, would also become extensively flooded.

MALTON, *Friday.*

It is thirty-five years since any approach to the scene of desolation witnessed to-day in the fertile vales of North Yorkshire has occurred. The constant rains of the last fortnight, culminating in the enormus rainfall of Wednesday, have carried destruction along the course of every river. Every valley has suffered from flood, more or less, but the greatest destruction has been in Ryedale, and among the Rye tributaries. In the upper part of the wide vale, a great lake has been formed by the rivers Rye and Riccal, which met, completely overflowing the whole intermediate country, inundating houses, and rendering roads impassable. Nunnington suffered much from this disaster, whole crops of stooked corn being floated away. The Kirkdale beck (always impetuous) rose with unexampled rapidity, and the ford was no longer safe. A pony and cart, with two persons in it, were carried some distance, and rescued with difficulty. Some other narrow escapes occurred here. The Farndale beck rose equally quickly, and at Yawdsworth Mill much timber was carried away, and a newly built house washed down. At Sinnington the Leven flooded the village, and floated large timber about in great confusion. Mr. Carter, of Kirbymoorside, with another gentleman, on horseback, were obliged to return to Pickering, and took refuge in the inn near the bridge. The house being full, they were compelled to sit by the fire till daylight, but the water entered during the night, and flooded the house, confining the inmates to the upper story, necescaries having to be given them from the street. The low part of the town of Pickering was much flooded. Between Kirbymoorside and Malton, miles of road

were flooded, and the inhabitants were prisoners in their houses in various places. At Marton the water was believed to be five feet deep in the village. From Normanby corn has been floated out of the fields as far as Barugh Hill, three miles. The damage in Ryedale cannot be estimated—whole farms are flooded. Not only corn-fields, but pastures, in splendid trim, are under water, and this morning stock were standing belly deep in the flooded lands. Near Malton the flood is increasing. By some accident the self-acting clough, in the Rye had been propped open, and in consequence the flood obtained access to Old Malton Moor, which, for the first time since the enclosure, half a century ago, is flooded. Farmers are busy fishing for their corn ricks in the flood waters. At Norton some pastures are overflowed, and much property has been destroyed in the brick-fields. Hundreds of acres are flooded by the bursting of the banks above Newsham.

The bridge near Grosmont, which failed yesterday morning, has become a total wreck, and a stationary engine erected to pump the water from the coffer-dam of the intended new bridge has been washed away, and is not yet found.

On Thursday morning, August 15th, the greatest flood ever known there occurred at Stokesley. The rain descended in torrents on 29th, and numberless cataracts were formed on Roseberry Topping and the adjacent hills. These meeting in the valley caused the small streams to be swollen into a foaming, rushing river. The stream called the Leven in particular overflowed its banks, and the water swept away all the sheaves and stacks of wheat along its course. On Wednesday evening the road between Stokesley and the Railway Station was so much flooded that the water entered the omnibus which was plying between the two places. The town itself, which adjoins the Leven, was under water, which entered a number of the houses in the lower part of the town, and was knee deep in the streets. The fields in which the show of the agricultural society was to have been held were flooded, so that not even an entrance into them could be effected, and under these circumstances the exhibition of stock had to be abandoned.

The inundations in North Yorkshire were rapidly lessened on Saturday, and on that day the North-Eastern Company had succeeded in throwing a temporary bridge across the Esk at Grosmont in place of that washed away on Wednesday night. During the floods it appears that, in addition to the damage to crops, many cattle and sheep were drowned, and some carcases were floating down the Derwent on Friday. Much land is still under water, and since the last report the banks above Ganton have burst and several farms are flooded, one farmer at Binnington having 100 acres of corn under water. The towns of Stokesley, Pickering, and Thirsk have suffered most.

As so often happens (in spite of the increased number of observers) there are few stations in the district which suffered most severely, and some of the stations being temporarily in charge of deputies, the returns are not so complete as they ought to be; in reply to inquiries we have been favoured with the following details:—

WHITBY.—Total rain in August 3·38, rain on 29th 2·22. The fresh down the river greater than for many years, but much exaggerated in some papers.—*M. Simpson.*

SCARBOROUGH.—Total in August 5·86, rain on 29th 1·82. Doubtless the superabundance of rain in July and the early part of August has kept the springs high, and so assisted in causing the great damage which was the *immediate* result of the rainfall of the 29th.—*Cornelius B. Fox, M.D., M.R.C.P.*

FILEY.—Total in August 3·85, on 29th 1·92.—*D. Philliskirk.*

BEADLAM GRANGE.—Total in August 4·13; on 29th 1·50.* From July 25th to September 3rd (6 weeks) we have had 8·2 inches.—*J. H. Phillipps.*

MALTON—Total in August 3·46, on 29th 1·30 inches.* Rain much heavier up by Beadlam Grange; flood came from that direction.—*H. Hurtley.*

NORTHALLERTON.—Total in August 8·60. Daily register not kept regularly, and fall for 29th unknown, but very great.—*W. T. Jefferson.*

MIDDLESBOROUGH.—Total in August 3·24, rain on 29th 1·85. A gale came up from N.E. on 28th, with rain, which continued all day on 29th. Large tracts of low land with the standing crops were flooded, several of the small streams were swollen and overflowed their banks, doing a large amount of damage.—*W. Fallows.*

* Approximate only; gauge not kept regularly owing to absence from home.

RAINFALL IN AUGUST, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	2·76	+ ·12	·87	29	17
II.		Staplehurst (Linton Park)	0 6	296	2·15	— ·56	·40	27	16
,,		Selborne (The Wakes)	4 0	500 ?	2.66	— ·51	·90	6	16
III.		Hitchen	2 0	240	3·16	+ ·81	·92	30	20
,,		Banbury	7 0	345	3·52	+1·39	·96	29	19
,,		Wisbech	0 6	10	3·42	...	·54	12	18
IV.		Bury St. Edmunds (Culford)	1 2	...	3·39	+ ·95	1·28	29	15
V.		Calne	0 11	250	2·52	...	·65	29	13
,,		Plymouth (Goodamoor)	0 2	580	6·52	+1·53	1·30	12	18
,,		Barnstaple	0 6	31	3·99	— ·20	·85	12	20
,,		Taunton (Fulland's School)	1 4	...	1·65	—1·03	·44	29	20
VI.		Shrewsbury (Highfield)	5 6	200	4·36	+1·47	2·02	29	16
,,		Tenbury (Orleton)	0 9	200	2·99	+ ·11	·78	30	20
VII.		Leicester (Wigston)	0 6	220	4·41	+2·22	1·30	29	21
,,		West Retford	0 6	50	2·73	+ ·40	·70	28	15
,,		Derby	5 0	180	6·56	+3·96	2·66	28	22
VIII.		Manchester	2 7	106	5·12	+1·62	1·08	29	26
IX.		York	0 6	50	3·06	+ ·35	·98	30	16
,,		Skipton (Arncliffe)	3 0	750	5·33	— ·61	1·08	29	19
X.		North Shields	1 0	124	3·24	+ ·39	1·39	29	19
,,		Borrowdale (Seathwaite)	1 0	422	12·69	—1·39	2·20	7	25
XI.	WALES.	Abercarn	1 3	450	4·51	...	1·95	6	15
,,		Haverfordwest	2 0	60	5·00	+ ·12	1·84	29	12
,,		Rhayader (Cefnfaes)	2 0	880	4·21	— ·45	·76	28	23
,,		Llanberis (R. Victoria Hotel)	1 0	370	6·42	...	·85	28	20
XII.	SCOTLAND.	Dumfries	0 5	70	3·27	— ·61	·36	6	23
,,		Hawick (Silverbut Hall)	4 0	512	3·31	...	·58	31	19
XIV.		Ayr (Auchendrane House)	2 3	94	4·86	+ ·89	·56	1	23
XV.		Otter House	0 6	130	6·89	+ ·87	1·12	6	22
XVI.		Leven (Nookton)	0 6	80	3·42	+ ·44	·51	6	19
,,		Stirling (Deanston)	0 0	130	6·14	+1·52	·92	6	22
,,		Logierait	1 0	250	3·66	...	·55	1	15
XVII.		Ballater	0 10	656	2·84	...	·47	1	19
,,		Aberdeen	4 8	115	3·29	...	1·06	8	20
XVIII		Inverness (Culloden)	3 0	104	2·42	...	·37	2 & 4	16
,,		Fort William	0 8	20	5·27	...	1·05	3	22
,,		Portree	0 4	60	7·84	+ ·39	1·46	26	25
,,		Loch Broom	0 8	48	4·87	...	1·25	3	21
XIX.		Helmsdale	1 0	34	2·74	...	·49	13	19
,,		Sandwick	2 0	78	3·24	— ·47	1·02	4	20
XX.	IRELAND.	Cork	6 0	65	4·60	...	1·23	22	18
,,		Waterford	4 0	60	3·49	— ·46	1·02	24	15
,,		Killaloe	5 0	128	4·55	— ·38	·63	6	24
XXI.		Portarlington	9 0	236	2·63	—1.86	·36	2	27
,,		Monkstown	0 6	100	2·22	— ·99	·43	1	24
XXII.		Galway	6 0	25	5·11	...	·72	26	23
,,		Bunninadden (Doo Castle)	1 0	...	5·39	...	·77	6	28
XXIII		Bawnboy (Owendoon)	1 3	218 ?	5·22	...	·72	6	26
,,		Waringstown	0 4	191	2·90	...	·65	1	26
,,		Strabane (Leckpatrick)	0 5	260	4·46	...	·56	8 & 18	26

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—Heavy continuous rain on 29th, and unusually dark, especially as there was no fog.

LINTON PARK.—The middle of the month pretty fine, but at no time has there been more than four consecutive dry days. T on 10th and 27th. Gale on 7th, frequent showers rather than any great rainfall. Winds chiefly S.W. and W. Harvest operations nearly completed, without much harm being done by the rain. The T S on the night of 26th-27th, very severe at Staplehurst; the T here was very alarming, but the rain appears to have been very partial, only ·40 in. falling here, and some of that not attributable to the T S which was at its height at 1 a.m.

SELBORNE.—High Wind with R all the evening of the 6th, and continued high winds till the 9th. Very dense fog from 20th to 25th. Max. ther. 73° on the 24th. Min. 37° on 19th. Prevailing winds S.W. to N.W.

BANBURY.—H and T in the neighbourhood on the 10th. T S on 28th; continued rain thence to 29th. Max. 73°. Harvest commenced in the first week; at the end of the month a large proportion of the wheat was carried, but much barley was still uncut.

WISBECH.—Gale on 4th, 12lbs; on 7th, 15lbs. L at 10 p.m. on 8th. T S on night of 10th, and at 3 p.m. on 16th. Fog on 22nd. Lunar halo on 23rd.

CULFORD.—High winds on 5th, 6th, and 7th. T S on 10th, 24th, and 29th. Weather during this month has not been very favourable for harwest operations; they are, nevertheless, nearly finished, and most of the grain got in tolerably good condition. Max. 78° on 26th.

GOODAMOOR.—T S at a distance on 16th, 20th, 26th, 27th, and 28th.

TAUNTON.—R fell in very heavy showers on 28th, registered at 9 a.m. on 29th ·44. Max. 85°·5 on 24th. Failure in wall fruit; apples very small and hanging in clusters on the trees.

DERBY.—2·66 in. was measured on the morning of the 28th; on the 2nd of August, 1846, 2·29 in. fell, which is the nearest approach to it in 25 years, the extent of my experience.

MANCHESTER.—T SS on 7th & 8th. The month may be considered remarkable, from rain having fallen nearly every day.

ARNCLIFFE.—First half of the month dark and sunless. Max. 66° on 20th.

NORTH SHIELDS.—Cloudy, damp mouth. Barley cut on 17th. Very fine to 19th, cloudy but fair to 25th. L on 26th. Large lunar halo on 27th. Heavy rain on 29th, 1·39 in. Wheat cut on 27th.

SEATHWAITE.—A cold, wet, and ungenial month, detrimental to harvest operations, though the crops are abundant. R on 25 days, on four of which it exceeded an inch.

WALES.

ABERCARN.—A dull heavy month, generally sultry, with occasional heavy rain, 2 in. having fallen in 24 hours on the 5th and 6th. Prevelent winds W. & S.W. Outbreak of Asiatic Cholera at Abercarn, on 27th.

HAVERFORDWEST.—The month commenced cold, cloudy, windy, and wet, so continued till the 14th, the succeeding 10 days being fine and dry, but below the average temp. of August, though some days were warm, the nights unusually so, on two or three nights exceeding 60°. On Monday the 27th, 6 p.m., a tremendous shower of rain producing ·40 in. in half an hour; the following day was cloudy and close, R began at 8 a.m. and continued with increasing steadiness and a heavy gale till past midnight; high winds and showery to the end of the month.

CEFNFAES.—Heavy storm of R on afternoon of 28th. An ungenial harvest month. H S 8 p.m. on 10th.

SCOTLAND.

DUMFRIES.—The weather during August has been broken and showery, there being only eight days without R. T on 11th and 31st. H on the 10th. Very unfavourable harvest weather, but the crops here sustained less injury than was expected. The R has been of great benefit to the pastures and turnip crop. Wheat and turnips fully an average; potatoes considerably above it; barley about the

average, and oats nearly so. The day temp. has been rather below, and the night above the average.

SILVERBUT HALL, HAWICK.—First two days rather cold; from 3rd to 9th very windy. T on 9th and 10th, followed by cloudy weather up to the 16th. Fine growing weather during the remainder of the month, turnips and other green crops generally looking well. Harvest operations commenced on most of the farms.

AUCHENDRANE.—Greatest rainfall on the first, ushered in our periodical rains called the "Lammas Flood," it has been more prolonged and abundant than usual, and has caused this August to be both a cold and wet month. High winds on 7th and 27th. Gale from S.W. on 26th. The greatest evaporation from a water surface ·240 in. was on the 1st, with S.W. wind and sky clear, no R till 3 p.m.; and the least was on the 9th and 14th with a N. wind and cloudy sky. *Blue* mist on 16th and 20th from 7 to 8 p.m., and on 21st. River highest on 19th, also a little raised on 5th, 7th, and 17th. A severe T S on 20th (the only one of the season); one of the road labourers near Ayr killed thereby. Potatoe disease first noticed on 24th.

OTTER HOUSE.—A wet month; R nearly an inch above the average; harvest commenced on the 27th; a fair crop of all kinds, turnips luxuriant; potatoe blight prevails to a certain extent.

DEANSTON.—No T except on 9th, and that distant; max. 69° on 26th; wet month; vegetation backward, very little done to the harvest at the end of the month.

LOGIERAIT.—A fine month for vegetation; the R at the beginning of the month was much needed; harvest operations now general.

ABERDEEN.—T on 7 days; fog on 8 days; bar. and temp. below the average; force of wind and rainfall, above it.

CULLODEN.—Showery; T on 9th.

FORT WILLIAM.—Fresh snow on Ben Nevis on 15th.

PORTREE.—August has again this year maintained its title to be called a wet month; the hay unsecured in July is still out, and of course in bad condition; the potatoe blight is making rapid progress; from the present appearance of the weather I fear the Highlandman must look forward to his usual harvest month (October) for weather for securing his crops. This month has done good in giving a plentiful supply of water, which was much needed from the dryness of the previous months; this Island is still healthy, except scarlatina amongst children.

LOCHBROOM.—Heavy wind on 3rd and hurricane on 4th both from N. August commenced rather unlike harvest weather, but on the 11th the weather became really autumnal, and since has continued propitious for "shearing" and ripening; the harvest is likely to be early for this country; the best farmers are already housing, and the later portions are whitening beautifully; the potatoes are excellent and free from blight and the turnip crop magnificent.

SANDWICK.—Gale (40 miles an hour), 3 p.m. 4th to 3 p.m. 5th.

IRELAND.

KILLALOE.—A remarkable prevalence of violent winds.

MONKSTOWN.—On almost every day this month more or less rain fell. The weather as a whole was cold and unfavorable for the harvest; max. having been 72° on the 24th and 26th; Bar. low, only above 30 in. on 10th & 14th; the gales of the 3rd, 4th, and 7th unusually severe for the season, and some injury done to the trees. H on 9th; very dense fog on 21st & 22nd.

DOO CASTLE.—A regular down-pour of R the whole of this month, the oat crop as a general rule as green as a leek. Hay which was cut at the beginning of the month is still unsaved, and low-lying meadows by the side of rivers have been inundated. The letter of Lord Portarlington which appeared in the papers about the middle of the month, stating that certain "indications" were in favour of fine weather up to the middle of September, has not been borne out, and farmers, to allay whose fears about the weather it was inserted, have been disappointed; T on evening of 25th.

OWENDOON.—The potatoe blight has shown itself very generally but not severely. The constant wet seems likely to have injurious effects on the harvest.

WARINGSTOWN.—Cold, showery, and unseasonable, with the exception of a few days in the last week; crops late; and the harvest much delayed.

LECKPATRICK.—Half the rain fell in the first eight days; a wet month and unfavorable for harvest, which should be in full progress.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

IX.] OCTOBER, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

ON THE FALL OF RAIN IN SEPTEMBER, 1866.

The rainfall of the past month has been, in the greater part of England, so exceptionally heavy, that it would well have merited special notice, even had there been no national and material interests involved; but when we are told, on high authority, that towards the close of the month each day's rain caused injury to the amount of nearly half-a-million sterling, it indeed behoves us to place the facts before our readers as fully and clearly as we can. Obviously the results of the comparatively few returns yet received *may* be modified when the whole are collected at the end of the year, but we anticipate amplification, not reversal of the indications afforded by the following tables.

Table I. is a continuation for the subsequent three months of 1866 of that given in *Meteorological Magazine*, No. VI. *p.* 58, whence the general distribution of rain during the present year may readily be seen; the leading facts being that the fall in the first six months has been nearly doubled by the subsequent three, and the nine months have had nearly (in some cases more than) 12 months' supply.

Table II. requires no explanation, and few remarks; the one most striking fact being the presence of the Devonshire returns amid and even above those from Westmoreland and Wales; and in fact the general reversal of ordinary position, consequent, as will be seen hereafter, on the *relative* excess having been less in the districts of (ordinarily) greatest rainfall.

Table III. is arranged with a view to showing the districts where the excess had been most remarkable; that is to say, where the proportion of the excess to the mean fall was the greatest. Perhaps we may be excused for elucidating this point, since we have been requested to do so on a previous occasion. In Table III. it will be seen that at Taunton the fall was 5·22 inches above the average, and at Goodamoor it was 9·75 inches above; yet the lesser excess is placed above the greater; it is so for this reason—viz., the total at Taunton is 6·88, and the excess is 5·22, hence the mean there is 1·66; then 5·22 is 4·13 times the average; but 9·75 at Goodamoor will be found to be only 3·09 times the average.

The design of this table being to show where the fall was most remarkable and unusual, the returns have been grouped in the order of decreasing relative excess, until indeed the last two stations had less than their average, Portree, in the Isle of Skye, having only 84 per cent. of its average, and Sandwick, Orkney, only 72 per cent.—a wonderful contrast to the fall in the south, where it was generally double

the average, in some places threefold, and at one is returned as more than four times the average.

TABLE I.—Rainfall in the first Nine Months of 1866.

STATIONS.	Total of first 6 months.	July.	Aug.	Sept.	Total of 9 months.	Average. 1860-65.	Difference.
England & Wales.							
Camden Town	17·08	1·19	2·76	3·89	24·92	18·51	+ 6·41
Linton Park	16·95	2·73	2·15	4·25	26·08	19·17	+ 6·91
Selborne	21·60	1·38	2·66	6·52	32·16	22·62	+ 9·54
Banbury	12·35	2·08	3·52	5·63	23·58	18·94	+ 4·64
Culford	14·30	2·25	3·39	3·01	22·95	17·01	+ 5·94
Goodamoor	28·46	2·42	6·52	14·40	51·80	39·12	+12·68
Barnstaple	18·22	2·60	3·99	7·07	31·88	28·14	+ 3·74
Taunton	17·00	1·79	1·65	6·88	27·32	19·16	+ 8·16
Shrewsbury	11·88	1·61	4·36	5·19	23·04	19·03	+ 4·01
Orleton	16·75	2·17	2·99	6·68	28·59	22·40	+ 6·19
Wigston	10·95	2·21	4·41	5·43	23·00	18·12	+ 4·88
Derby	12·47	2·41	6·56	4·79	26·23	19·13	+ 7·10
Manchester	14·22	4·31	5·12	7·13	30·78	24 74	+ 6·04
York	9·69	2·91	3·06	4·04	19·70	17·09	+ 2·61
Arncliffe	30·25	5·24	5·33	11·19	52·01	38·74	+13·27
N. Shields	10·05	3·70	3·24	3·60	20·59	19·04	+ 1·55
Seathwaite	75·81	11·18	12·69	21·35	121·03	103·52	+17·51
Haverfordwest	26·24	1·55	5·00	9·51	42·30	31·48	+10·82
Cefnfaes	23·76	2·41	4·21	6·98	37·36	31·42	+ 5·94
Scotland.							
Dumfries	14·80	2·84	3·27	5·88	26·79	25·94	+ 0·85
Auchendrane	20·61	3·32	4·86	5·91	34·70	30·15	+ 4·55
Nookton	13·22	2·87	3·42	2·73	22·24	19·87	+ 2·37
Deanston	21·42	3·27	6·14	5·89	36·72	29·74	+ 6·98
Portree	45·00	3·90	7·84	9·11	65·85	51·34	+14·51
Sandwick	18·27	1·64	3·24	2·65	25·80	23·90	+ 1·90
Ireland.							
Waterford	19·23	·85	3·49	3·96	27·53	27·65	— ·12
Killaloe	25·58	1·96	4·55	6·47	38·56	33·30	+ 5·26
Portarlington	16·19	1·22	2·63	4·16	24·20	29·14	— 4·94
Monkstown	16·46	·89	2·22	2·70	22·27	21·40	+ ·87

TABLE II.—Rainfall in September 1866. Stations arranged according to amount.

The Stye, Borrowdale	22·62	Coniston	12·10
Seathwaite, ,,	21·35	,,	11·76
Sprinkling Tarn	19·80	Arncliffe, Skipton	11·19
Snowdon, Hafod-y-llan	18·48	Chepstow	10·57
Stonethwaite	17·83	Vicarage, Kirkby Lonsdale	9·92
Stye Head	17·44	Kendal	9·77
Beddgelert	16·71	Casterton, Kirby Lonsdale	9·76
N. Hessary Tor, Dartmoor	16·71	Haverfordwest	9·51
Rhiwbryfdir	16·37	Fort William, Inverness	9·43
Prison Reservoir, Dartmoor	15·05	Portree, Isle of Skye	9·11
Goodamoor, Plymouth	14·40	Belgrave, Sidmouth	8·87
High Close, Grasmere	14·35	Bolton-le-Moors	8·66
Mosedale	13·86	Lancaster	8·04
Abercarn, Monmouth	13·39	West Hoathly, Sussex	7·72
Llanberis, R. Victoria Hotel	13·05	Weymouth	7·54
Esk House	12·54	Presteign, Radnor	7·52
Tynant, Cardiff	12·50	Clifton, Gloucester	7·40
Dolgelley	12·46	Wainsford, Lymington	7·40
Cardiff	12·10	Shirley Warren, Southampton	7·34

TABLE II.—(*continued.*)

Manchester	7·13	Highfield House, Nottingham	4·97
Riverhead, Sevenoaks	7·09	Cessnock Park, Glasgow	4·84
Marlborough College	7·07	Derby	4·79
Barnstaple	7·07	Ilkley, York	4·75
Cefnfaes, Rhayader	6·98	New Brighton, Liverpool	4·67
Galway	6·96	Logierait, Perth	4·43
Bath	6·89	Leckpatrick, County Tyrone	4·40
Taunton	6·88	Guildford, Surrey	4·36
Cranbrook, Kent	6·74	Cork	4·34
Orleton, Worcester	6·68	Linton Park, Kent	4·25
Calne, Wilts	6·66	Portarlington	4·16
Selborne, Hants	6·52	York	4·04
St. Lawrence, Isle of Wight	6·51	Waterford	3·96
Killaloe	6·47	Beadlam Grange, Yorkshire	3·95
Norton in Hales, Salop	6·47	Mill Hill, Hendon	3·95
Kingham, Chipping Norton	6·10	Killingholme, Lincoln	3·93
Knaptoft, Rugby	5·98	Camden Town	3·89
Ayr	5·91	Waltham Abbey, Essex	3·83
Deanston, Stirling	5·89	Inisnag, County Kilkenny	3·66
Dumfries	5·88	North Shields	3·60
Northampton	5·85	Boston, Lincoln	3·55
Malvern	5·79	Waringstown, County Down	3·48
Banbury	5·63	Hawick, Roxburgh	3·43
Lochbroom, Rosshire	5·62	Twickenham	3·42
Hythe, Kent	5·54	Staines	3·41
Braystones, Whitehaven	5·39	Culloden, Inverness	3·07
Hereford	5·30	Culford, Bury St. Edmunds	3·01
Glasgow	5·21	Aberdeen	2·99
Doo Castle, Sligo	5·20	Middlesboro'-on-Tees	2·96
Shrewsbury	5·19	Hillington, Norfolk	2·89
Broomsgrove	5·17	Ballater	2·83
Bromley Common, Kent	5·15	Wisbech	2·79
Great Missenden, Bucks	5·15	Monkstown, Dublin	2·70
Owendoon, County Cavan	5·13	Sandwick, Orkney	2·65
Auchterarder, Perth	5·00	Sutton Park, Bedfordshire	2·40
Markree, County Sligo	4·97	Helmsdale, Sutherland	2·30

TABLE III.—Rainfall in September, 1866, compared with the mean in September, 1860-65.

[Stations in order of greatest relative excess, *i.e.*, showing by their sequence where the excess has been most remarkable.]

Stations.	Total.	Excess.	Ratio. Mean100	Stations.	Total.	Excess.	Ratio. Mean100
Taunton	6·88	+5·22	414	Culford	3·01	+1·40	187
Goodamoor	14·40	9·75	309	Cefnfaes	6·98	3·14	182
Clifton	7·40	4·79	284	Bolton	8·66	3·77	177
Selborne	6·52	4·08	267	Coniston	12·10	5·24	176
Haverfordwest	9·51	5·80	256	York	4·04	1·70	173
Orleton	6·68	3·99	248	Camden Town	3·89	1·63	172
Banbury	5·63	3·26	237	Auchterarder Ho.	5·00	1·95	164
Shrewsbury	5·19	2·99	236	Seathwaite	21·35	8·14	162
Arncliffe	11·19	6·23	226	Ayr	5·91	2·18	158
Dumfries	5·88	3·15	215	Cessnock Park	4·84	1·77	157
N. Shields	3·60	1·90	212	Killaloe	6·47	2·31	155
Derby	4·79	2·44	204	Monkstown	2·70	·71	135
Broomsgrove	5·17	2·57	199	Portarlington	4·16	·88	127
Manchester	7·13	3·43	193	Waterford	3·96	+ ·83	126
Linton Park	4·25	2·03	191	Portree	9·11	—1·66	84
Barnstaple	7·07	3·30	187	Sandwick	2·65	—1·01	72
Deanston	5·89	+2·74	187				

Not having yet received the returns of rainfall in September from our French correspondents, we are only able to mention the not generally known fact, that many of the Departments have suffered severely from the inundations caused by the excessive rains of the past month.

The *Journal de la Nièvre* says :—

"We regret to learn that the inundations of the Seine have seriously affected one of the most important industries in the department of the Nièvre—the commerce in wood. The floods took place at the moment when the supply for Paris was in process of collection, and the greater part has been carried away by the waters. The damage is immense. Such a disaster has not occurred since 1836."

A letter from Paris, dated October 5th, says :—

"The waters of the Seine, that had been falling for the last few days, showed a slight ascensional movement yesterday. The level of the river marked only 4 metres 70 centimetres on Wednesday, but yesterday it stood at 4 metres 80, by the graduated scale of the Pont Royal. There is every reason to believe, however, that this fluctuation will be but slight, as it is very probable that the inundation has done its worst. It must not be supposed, however, that the amount of actual mischief done will have any great effect upon the general prosperity of the country. Many of the departments have not suffered in the least, and in those that have been most exposed to the water only a very small portion of the soil has been rendered unfit for the autumn sowing. In fact, the disasters may be said to be entirely local, almost like those produced by hail and other storms, which seldom produce any great deficit in the total of the country's produce. The rise, therefore, that has just taken place in bread and other necessary articles of consumption, appears to me scarcely justified, and it is very probable that there will be a corresponding fall, especially if the weather should turn out fine enough to allow the October sowing to be proceeded with without interruption. As regards the poorer classes of sufferers, the appeals for aid undertaken by the authorities are being pretty generously responded to, and already more than 200,000f. has been collected."

It is satisfactory to be able to add that October has hitherto been characterized almost universally by weather the opposite of September —viz., high barometer and no rain. It is rather worth noting, that this year has been in marked contrast to 1865 in many points—especially that September, 1865, was as remarkably dry as 1866 was wet, and that at present October bids fair to be as dry as October, 1865, was wet.

We need hardly say that this change has been of incalculable benefit to the farmers, reports from all parts bearing uniform testimony.

HARVEST OF CANADA.

The Grand Trunk Railway Company have made their usual collection of reports on the harvest from the various districts through which the railroad passes. The *Montreal Herald* states the result as follows:—"These reports show the truth of the opinion generally formed, that while the appearance of the harvest in the early part of the season was remarkably fine, the excessively wet weather has to a great extent frustrated the hopes of the cultivator, except in the extreme west, where the grain ripens early. The further we come eastward the worse appears to be the position of affairs. Thus in place of the abundance which was reasonably anticipated at Midsummer, we fear that we can hardly expect an ordinary average crop throughout the country." The *Toronto Globe* says :—"It will be seen that, notwithstanding the unfavourable harvest weather of the past month, the crops generally may be said to be good. The injury caused by the rain has not been so great in the Western portion of the province as in Central and Eastern Canada. When the wheat is thrashed Canadian farmers will have no reason to complain. The coarse grains are far above the yield of past years. Barley a good yield, but of a very poor colour, owing to the rains. On the whole, although the extravagant anticipations of Midsummer are not realized, the gloomy forebodings of the earlier part of the season are still further wide of the mark."

RAINFALL IN SEPTEMBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	3·89	+1·63	·47	21	22
II.		Staplehurst (Linton Park)	0 6	296	4·25	+2·03	·81	8	23
,,		Selborne (The Wakes)	4 0	500 ?	6·52	+4·08	·82	4	27
III.		Hitchen	2 0	240	2·63	+ ·77	·31	9	24
,,		Banbury	7 0	345	5·63	+3·26	·94	4	27
,,		Wisbech	0 6	10	2·79	...	·45	4	19
IV.		Bury St. Edmunds (Culford)	1 2	...	3·01	+1·40	·52	8	21
V.		Calne	0 11	250	6·66	...	·77	4	27
,,		Plymouth (Goodamoor)	0 2	580	14·40	+9·75	1·74	5	27
,,		Barnstaple	0 6	31	7·07	+3·31	1·05	4	30
,,		Taunton (Fulland's School)	1 4	...	6·88	+5·22	·94	5	27
VI.		Shrewsbury (Highfield)	5 6	200	5·19	+2·99	1·00	28	19
,,		Tenbury (Orleton)	0 9	200	6·68	+4·00	·97	29	29
VII.		Leicester (Wigston)	0 6	220	5·43	+3·22	·65	4	24
,,		West Retford	0 6	50	...	...	...	...	...
,,		Derby	5 0	180	4·79	+2·45	·51	16	27
VIII.		Manchester	2 7	106	7·13	+3·43	1·15	5	25
IX.		York	0 6	50	4·04	+1·71	·51	6	27
,,		Skipton (Arncliffe)	3 0	750	11·19	+6·23	·95	21	26
X.		North Shields	1 0	124	3·60	+1·90	·76	8	22
,,		Borrowdale (Seathwaite)	1 0	422	21·35	+8·14	3·30	21	29
XI.	WALES.	Abercarn	1 3	450	13·39	...	1·83	4	26
,,		Haverfordwest	2 0	60	9·51	+5·80	1·00	7	23
,,		Rhayader (Cefnfaes)	2 0	880	6·98	+3·14	·85	6	27
,,		Llanberis (R. Victoria Hotel)	1 0	370	13.05	...	1·96	10	24
XII.	SCOTLAND.	Dumfries	0 5	70	5·88	+3·15	·71	28	26
,,		Hawick (Silverbut Hall)	4 0	512	3·43	...	·97	28	25
XIV.		Ayr (Auchendrane House)	2 3	94	5·91	+2·17	1·23	20	23
XV.		Otter House	0 6	130	...	...	...	...	...
XVI.		Leven (Nookton)	0 6	80	2·73	+ ·25	·41	18	21
,,		Stirling (Deanston)	0 0	130	5·89	+2·74	·93	18	22
,,		Logierait	1 0	250	4·43	...	·70	28	19
XVII.		Ballater	0 10	656	2·83	...	·68	28	16
,,		Aberdeen	4 8	115	2·99	...	·45	28	22
XVIII		Inverness (Culloden)	3 0	104	3·07	...	·52	14	15
,,		Fort William	0 8	20	9·43	...	1·54	18	26
,,		Portree	0 4	60	9·11	—1·66	1·45	20	24
,,		Loch Broom	0 8	48	5·62	...	·90	20	20
XIX.		Helmsdale	1 0	34	2·30	...	·42	14	16
,,		Sandwick	2 0	78	2·65	—1·01	·50	2	14
XX.	IRELAND.	Cork	6 0	65	4·34	...	·57	15	28
,,		Waterford	4 0	60	3·96	+ ·83	·49	9	25
,,		Killaloe	5 0	128	6·47	+2·31	·74	10	24
XXI.		Portarlington	9 0	236	4·16	+ ·88	·71	7	27
,,		Monkstown	0 6	100	2·70	+ ·71	·65	9	21
XXII		Galway	6 0	25	6·96	...	·93	14	24
,,		Bunninadden (Doo Castle)	1 0	...	5·20	...	·90	20	27
XXIII		Bawnboy (Owendoon)	1 3	218 ?	5·13	...	·82	13	24
,,		Waringstown	0 4	191	3·48	...	·50	18	23
,,		Strabane (Leckpatrick)	0 5	260	4·40	...	·85	13	22

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—T S and H with rainbow and bright sunshine, all at the same time, from 5.15 to 5.30 p.m., on 2nd; Fog on 25th.

LINTON PARK.—T on the 8th, and more distantly on 23rd; heavy R on both occasions. The whole month wet and often windy, contrasting strongly with September, 1865. R on 23rd caused a slight flood in the rivers; the last three days fine and dry. Harvest operations much retarded where not completed in August, and hop-picking (an important affair in this county) has also proceeded under difficulties. Wind mostly S., S.E. and S.W., the last day the hottest in the month.

SELBORNE.—The almost incessant rain rendered it impossible to get in the corn, much of which is damaged, as are also some of the hops. L on 2nd. T on 6th, 17th, and 20th. Aurora on 15th and 16th.

BANBURY.—T S and H at 3.15 p.m. The wettest month since October, 1852. Harvest not yet complete. Max. 67°, min. 36°.

WISBECH.—H, L, on 2nd; T at 3 p.m., L at 8 p.m. on 15th. Gale, 7 lbs., on 11th. This was a dull wet month, the air frequently saturated (mean degree of humidity 93·7); the harvest work was much retarded; oat and pea straw much injured.

CULFORD.—T on 6th; max. 73° on 30th, min. 38° on 17th and 24th. One of the wettest Septembers on record in this locality.

CALNE.—Storms with T in N. on 2nd; R fell on every day, but less than ·010 on 19th, 22nd and 24th; stormy on 2nd, 5th, 6th, 10th, 11th, 14th, 15th and 21st. T S with H at 3 p.m., on 16th.

GOODAMOOR.—Fog 18th; stormy on 2nd, 4th, 5th, 6th, 9th, 13th, 14th, 15th and 18th; max. 72° on 30th. Total rain more than ever recorded except in November, 1852 (=15·54).

TAUNTON.—Max. 81°·5 on 28th. Rainfall throughout the month, except on 15th, 18th, and 20th; T S on 5th, 8th, and 23rd, the T on 8th being particularly sharp. The warm showers have produced luxuriant pasturage. Development of various fungi: mushrooms in abundance where never before noticed.

ORLETON.—T on 5th. A perfect contrast in all respects to this month in 1865, when R fell only on 2 days, and the sky was frequently cloudless. In this month R fell on every day but on 14th it was under ·01; there was very little sun, but generally a clouded sky, and rough changeable winds, and the temp. below the average; max. 66°·5 on 4th, min. 35°·5 on 23rd; bar. low throughout. This month's rainfall has been exceeded only five times in 36 years:—viz., July 1834=9·23 (with T S S), September 1852=7·07; November 1852=8·22, June 1860=7·25, July 1861=6·69. Brooks and rivers flooded at the end of the month.

DERBY.—Another unusually wet month, the rainfall for September and August being 11·35. For the last 9 weeks the bar. has been below 30 in., but it is now slightly above that reading.

MANCHESTER.—Since 1794 there has been no September with a rainfall anything like that of the present year. We may almost say we have had incessant R.

ARNCLIFFE.—One of the most continuously rainy months I have ever registered, and considerably more than double the average.

NORTH SHIELDS.—T on 2nd. Extremely cloudy and damp with very little sunshine.

SEATHWAITE.—R on every day except the 9th; more than 3 in. fell on the 21st, and nearly 3 in. on 11th, more than 2 in. on 3 days, and more than 1 in. on 7 days, in fact 13·58 in 7 days=1·95 each day and ·71 for each in the month, and yet from the prevalence of wind, the evaporation has been considerable and the corn harvest has suffered but little, though the potatoe crop is severely injured.

WALES.

ABERCARN.—Stormy on 10th, 16th, and 18th. Winds westerly till 17th, then southerly to the end. So wet a September has not been known for many years; the crops rotting on the ground, it being impracticable to haul them in.

HAVERFORDWEST.—The most stormy and disastrous September of which I have any record (during 17 years). Harvest operations much impeded by the continued heavy rains, and furious gales which prevailed almost without intermission till the 21st. T S on 23rd, at 5 p.m.

CEFNFAES.—A continuance of R, and occasionally gales of wind, chiefly from the S.W. ; there has not been an entire day and night without R, since the 27th August. Temp. cold for the season ; crops of grain of all kinds very seriously injured ; potatoe disease very much increased.

SCOTLAND.

DUMFRIES.—T on 1st; the month one of the wettest for above 17 years; harvest very protracted. Temp. low, being 6°·24 below that of last September; Bar. 30·13, on 30th, being the first time it has reached 30 in. since July 26th.

SILVERBUT HALL, HAWICK.—The coldest, wettest, windiest, and dullest September we have had here for many years. The turnips and mangold wurzels, those unamiable crops, which will not thrive in pleasant weather, have a most luxuriant appearance; but there are doleful complaints about the prevalence of the potatoe disease, and all the corn crops (of which there are still many fields to cut) have suffered more or less from the drenching R.

AUCHENDRANE.—High floods in the river on 20th, at 7 p.m. Although the rainfall has been excessive, the moderate temperature, and brisk winds have combined to protect the grain crops from injury.

DEANSTON.—T on 1st; very dull and wet. Grain crops not all secured at the end of the month, and some even not cut in the higher lands.

LOGIERAIT.—A very wet month; much corn still ungathered.

BALLATER.—Aurora on 16th; beautiful lunar rainbow on 18th; gale on the 25th; a fir tree uprooted thereby. In consequence of the backwardness of the weather, the harvest is much later than last year, and much of the corn is mixed up with a second growth.

ABERDEEN.—T S 1st and 2nd; a dull, close, wet, unseasonable month; humidity 10 per cent. in excess of mean of last 10 years; wind rather below the mean; ozone very deficient. Aurora on 7th, 13th to 17th, 19th, and 21st.

CULLODEN.—Fog on 29th. Aurora on 16th. Lunar rainbow, 7 p.m. on 26th.

FORT WILLIAM.—Fresh snow on Ben Nevis on 14th, and again on 21st; T on 25th.

PORTREE.—T on 2nd, & T S with heavy hail showers on 21st; solar halo on 4th; lunar halo on 21st and 27th. Gale on 25th; frost on 4th and 18th. No harvesting could be done during the month, so that the crops are in bad order, but the farmers have great hopes of October, and at present it looks well for the gathering in of the crops. Scarlatina still continues; people of all ages, including a great number of children, have died from it, otherwise the island is healthy.

LOCHBROOM.—Gale on night of 9th ; T on 10th, and stormy on 11th ; from the 17th to the end, R on every day except the 24th, 25th, and 26th. The weather was warm but unpropitious for the housing of crops which are now, notwithstanding, safely secured except in a few cases. The rainfall was in excess of the six preceding months, causing much anxiety to the farmer. Turnips are luxuriant, but signs of the disease are appearing.

SANDWICK.—T and heaviest fall of R on 2nd. Aurora on 7th, 8th, 15th, 18th, and 19th. Rainfall below the average, and below the mean of August, indeed it generally is so, as this is our little summer. The R in a series of years increases from the min. in May to the max. in October, with this exception in September. This last month and indeed all the summer has been fine in Orkney, so that a great part of the crop has already been secured in excellent condition, while much damage has been done in many southern parts of Britain.

IRELAND.

KILLALOE.—Storms on the 9th, 10th and 11th, all leaves and young branches exposed to these winds were completely blasted, the other side of the tree remaining green; violent wind again on 21st. The wettest September in 21 years except two, 1859 = 6·83 and 1861 = 7·57.

MONKSTOWN.—R frequent but slight ; frost on 3 or 4 nights, Min. 28° on grass on 22nd ; 9th, 10th, and 11th, very wild weather, culminating in a terrific gale on the 11th.

DOO CASTLE.—Strong gale on 11th. In consequence of the persistent rainfall, all farm produce has been injured; I have been told, and by a very competent authority, that it will show a falling off of between a third and a half. About 5 miles from hence, a tropical shower fell on the 14th, which literally tore up the road and formed a rapid stream in 20 minutes. Last 3 days of the month very fine.

OWENDOON.—High winds on 9th & 10th. Reaping commenced on 18th. The constant wet greatly retarded all farming operations this month, and the whole country was beginning to despond; the weather, however, seemed to improve with the full moon on the 23rd, and we are in hopes that little damage is done, except on the flooded districts.

WARINGSTOWN.—T S with H at 3 p.m. on 15th; T shower very cold on 21st. Wet, stormy, and cold; such weather has rarely been experienced during the harvest in this district, but from the cold high winds, the damage to grain from sprouting has not been as great as might otherwise have been expected.

LECKPATRICK.—Very wet month; incessant R from the 10th to the 22nd; very unfavorable for harvest operations.

BELTON VICARAGE, LOUGHBOROUGH, *Sept. 19th*, 1866.—SIR,—I send you the following extract from my rainfall register, seeing from the Magazine that you have not hitherto had any figures so high communicated to you for August 28th. From 8·30 a.m. August 28th, to 8·30 a.m. August 29th, 2·84 in.: but from noon August 28th, to noon August 29th, 3·01 in.; total for August, 5·52 in. Your obedient servant,—R. DALBY.

EARTHQUAKE AT BUDLEIGH, SEPTEMBER 13TH.

To the Editor of the Meteorological Magazine.

DEAR SIR,—The enclosed letter is from the *Exeter Gazette*. The sensation felt by the writer was, that somebody was shaking the shutters from outside. East Budleigh is 4 miles W. of Sidmouth. I cannot find that it was felt or noticed here, but a gentleman told me he distinctly felt it at Branscomb, 4 miles E. of Sidmouth. Barometer 29·740 Ther. 62°·2. Truly yours,

Belgrave, Sidmouth. J. INGLEBY MACKENZIE, M.B. Cantab, F.M.S.

P.S.—Our average annual rainfall here is about 28 inches; up to September 30th this year I have registered 30·35.

To the Editor of the Exeter and Plymouth Gazette.

SIR,— Two distinct shocks were felt here at a quarter to ten on Thursday night. The windows of my house rattled violently. About five minutes elapsed between the two shocks, and the last was the more violent of the two. I believe that the cause was an earthquake. The night was quite calm at the time.

Your obedient servant,

East Budleigh, September 14th, 1866. R. H. LIPSCOMB.

METEORS.

KING'S CROSS, HALIFAX.

September 1st, 8.45 p.m. local time.

Meteor in S., first seen 10° above horizon, a little E. of Jupiter and below him; moved steadily in an upward slanting direction towards S.S.W.; distance moved, about 20°; left a train of light; path, a straight line; burst into fragments; no noise. The Meteor itself and the fragments were deep red. Time, about 3 seconds. Sky dull on horizon; very many stars near zenith; wind low, and from S.S.W.

JOSEPH GLEDHILL, F.M.S.

To the Editor of the Meteorological Magazine.

SIR,—It may interest some one to know that as I was driving from Shap to Penrith, on the evening of the 27th of September, I saw a very fine Meteor, pale yellow, start from a point under the Pole Star and travel horizontally and slowly above the two upper stars in the Great Bear, fading away above Arcturus; its train was visible for some seconds, and was brightest in the middle of the track. The Meteor was brighter than Jupiter, which was shining at the time. I had no lights and could not see my watch; I should think it might be a quarter to eight, but you can ascertain the time the moon rose that night, and put the Meteor a quarter of an hour earlier. Yours, &c., T. H. F.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

X.] NOVEMBER, 1866. [PRICE FOURPENCE, or 5s. per ann. post free

RAINFALL INVESTIGATIONS IN FRANCE.*

IT must be a source of great pleasure to all interested in the progress of rainfall inquiries, to find other nations taking up the subject with great energy; and that there is reason to hope, ere very long, that a thorough interchange of results may be of equal interest and utility to Meteorologists and Engineers in this and other countries. We cannot better illustrate the developments recently given to such inquiries, than by noticing the works enumerated at the foot. Professor Raulin's splendid monograph has long awaited that full and detailed notice which it merits, and our limited space precludes. The introduction gives a running narrative of the establishment of rain gauges at the various places in the south west of France; then follows Part I. devoted to observations, those from each station being preceded by full particulars of the size of the gauge, its height above ground and above the sea, where the observations have been taken, and by whom, also (if published) in what works they have been printed; then follow tables giving the total fall in the civil year, and in each month thereof, in each meteorological quarter, and year (*i. e.*, December 1 to November 30) also if the register embraces many years, an abstract in decennial means, and means, max. and min., of the whole period. Of course all these details are not always known, but their completeness may be estimated from their occupying over 200 pages of closely-printed matter. An appendix to the first part, by M. Abria, deals with the principal causes of differing results obtained at contiguous stations. Speaking of the relative rainfall indicated by large and small gauges, M. Abria remarks, "observations continued during a year with two gauges whose receiving surfaces were nearly as 20 to 1, have given almost identical results, not only in the totals, but even in the monthly values, which generally differ very slightly, the excess being sometimes on one side, and sometimes on the other." From the table we find that his gauges were respectively $4\frac{1}{2}$ and 20 inches in diameter; during the year the large gauge collected

* *Observations Pluviométriques faites dans le Sud-Ouest de la France (Aquitaine et Pyrénées) de* 1714 *a* 1860, *suivies des grandes séries de Montpelier, Paris, Genève et le Grand-Saint-Bernard et des resultats de quelques Observations Pluviométriques par M. Abria.* Par M. RAULIN, Professeur de Géologie à la Faculté des Sciences de Bordeaux. 1864. Paris: F. Savy, Rue Hautefeuille, 24. 1 vol. 8vo, 320 pp.

Commission Hydrométrique et Commission des Orages de Lyon, 1865—22e *Année. Résumé des Observations recueillies dans les Bassins de la Saone, du Rhone et de quelques autres Régions Accompagné de Notices diverses.*

Tableau Comparatif des Observations Pluviométriques faites dans le Sud-Ouest de la France en 1865. Par M. V. RAULIN. Bordeaux, 1866.

31·54 in., and the small one 31·02. The second portion of Professor Raulin's work is devoted to comparisons and deductions of great interest.

The next work to claim notice, is the twenty-second report of the Hydrometric Commission of Lyons, and as all our readers may not be aware of the objects and duties of this body we may briefly mention that built as Lyons is, almost level with the Saône and the Rhône, which there unite their streams, it has always been very liable to destructive inundations. About 20 years since, it was resolved to establish rain gauges at different points in the upper watersheds of the rivers and endeavour from their indications to compute the height to which the river would probably rise; this has long been accomplished: each flood anticipated by several hours, by public notice of its approach, and the probable height to which the water will rise on certain of the bridges; so that the valuable merchandize for which the city is so famed may be removed above the line of danger. This we believe to have been the original purpose of the Commission, but its talented president has wisely not confined himself to this narrow field, but in successive volumes has published a series of articles on the meteorology and hydrology of the district of high interest. That just received may be taken as a fair type of its predecessors, and we therefore epitomize its contents.

1. Abstract of meteorological observations in 1865; the most remarkable feature being the high temperature, every month being above the average, and the mean of the year (56°·3 F) 3°·8 F above the usual mean (52°·5 F). The hottest year previously was 1859 (55°·2 F). This heat has permitted the various crops to ripen perfectly, and the vine especially has yielded magnificent produce.

Following these introductory remarks, are the monthly rainfall returns from the undermentioned stations; we add the total fall in 1865 at each, remarking, *en passant*, that at scarcely any Station was there a drop of rain in September.

WATERSHED.	STATION.	Height above Sea. feet.	Depth of Rain. inches.
Bassin de la Saone Supérieure	Courlon	1090	31·9
	Vesoul	784	20·6
	Gray	768	22·4
	Dijon	869	21·5
Bassin de la Saone Inférieure	Châlon	594	20·7
	Lons-le-Saulnier	856	15·1
	Bourg	919	39·0
	Fort Lamotte	597	31·0
Bassin du Doubs	Fort de Joux	3281	35·7
	Montbéliard	1273	47·9
	Besançon	1191	30·1
	Dôle	752	25·8
Bassin de l'Ardière	Monsol	1926	34·2
	Cercié	755	30·7
Bassin de l'Azergues	St. Nizier d'Azergues	1309	26·8
	St. Laurent d'Oingt	1810	28·6
Bassin de la Brevenne	Tarare	1312	30·9
	L'Arbresle	742	27·7
	Ste-Foy-l'Argentière	1418	30·4
	Duerne	2703	27·2

WATERSHED.	STATION.	Height above Sea. feet.	Depth of Rain. inches.
Bassin du Rhône	Givors	502	31·6
Bassin du Rhône Supérieur	St. Bernard	8173	43·7
	Genève	1221	28·2
	Les Rousses	3645	48·0
Bassin du Rhins	Cublize	1525	29·6
Littoral Méditerranéen	Marseille	158	17·3

Daily observations at Lyons Observatory, and a sheet of curves, somewhat like Mr. Cator's Weather Diagram (see *Meteorological Magazine*, vol. i. p. 26) are followed by tables showing the daily rainfall at each of the stations just named, and also the direction of the winds, with remarks on thunderstorms and other occasional phenomena. Tables of the daily height of the Rhone at Pont Morand, from 1826 to 1855, and their careful analysis, occupy very many pages; and the report closes with a paper by M. Fournet, to which he merely gives the unassuming title of "*Documents relatifs à la Commission Hydrométrique et a celle des Orages*," but which is really a masterly epitome of the progress of Meteorology and Hydrology in France, with articles on their relations to health, agriculture, geology, and water supply, analyses of the rivers and the chemistry of the atmosphere, to which we hope to recur on a future occasion.

The last work we have to notice is, in fact, a *British Rainfall* on a small scale; and here we have to congratulate Prof. Raulin on the increasing completeness of the geographical distribution of his stations, while we cannot but regret the absence of columns specifying the height of the gauges above the ground, and above the sea. We have in the following conversion of his results into English measures, supplied the deficiency from the previously mentioned large work, but obviously it is *possible* the heights may have been altered.

RAINFALL OBSERVATIONS IN THE SOUTH-WEST OF FRANCE, 1865.

STATIONS.	Height of Gauge. Above Ground.	Height of Gauge. Above Sea.	Depth of Rain.	STATIONS.	Height of Gauge. Above Ground.	Height of Gauge. Above Sea.	Depth of Rain.
	feet.	feet.	inches		feet.	feet.	inches.
Paris (Terrace)	89	279	18·9	Bordeaux (Fac. of Scs.)	32	62	30·0
,, (Courtyard)	0	190	19·8	,, (M. Petit Lafitte)	29	62	34·6
Aquitaine North-West, or Charentaise.				,, (Mil. Hosp.)	...	..	35·3
Poitiers	...	...	32·3	Bouliac	0	213	36·4
Melle	...	...	24·3	Cadillac	10	46	32·4
Comporté (near Niort)	...	...	32·7	Langon	10	158	31·9
Courçon	14	33	31·5	Col-de-Fer	13	75	25·2
Marans	...	21	31·9	Lavallade	...	656	23·9
La Rochelle (P.-et-Ch.)	5	18	33·6	Fumel	43	551	27·5
,, (Mil. Hosp.)	...	...	29·6	Villeneuve	...	...	28·0
St. Jean d'Angély	16	56	34·4	Agen (M. Magen)	26	174	30·2
Rochfort	4	21	34·9	,, (P.-et-Ch.)	7	184	28·9
Royan	...	16	30·3	Sos	...	427	21·8
Montguyon	23	325	37·4	Auch	...	...	39·9
Confolens	2	428	39·5	Mount-de-Marsan	7	138	30·2
Aquitaine West, or Bordelaise.				Beyrie	30	338	39·3
Arcachon	...	...	30·8	Peyrehorade	23	46	42·7
Bordeaux (Eta. Paulin)	...	...	38·0	St. Martin-de-Hinx	...	...	56·8
,, (Botanic Gard.)	...	..,	38·8	Bayonne (P.-et-Ch.)	...	...	45·2

Bayonne (Mil. Hos.)	...	...	51·6	Saint-Chély	...	3215	27·8
Aragori	...	...	75·8	Marvejols	...	2100	26·1
Lescar	...	...	37·9	Mende	...	2426	28·0
Peyranère	3	4645	69·1	Montmirat	...	...	21·3
Bagès-Béost	5	2204	34·5	Florac	...	...	33·7
Bagnères-de-Bigorre (P.-et-Ch.)	6	1782	59·0	La Blaquière	20	2645	22·9
,, ,, (M. Lyte)	...	...	51·5	Rodez	...	..	20·5
Aquitaine East, or Toulousaine.				Carmaux	27	797	26·3
				Albi	36	590	28·6
Cahors	...	459	25·9	Castres	13	572	19·2
Figeac	...	738	26·0	Alban	27	2097	32·9
Montauban	10	285	22·0	La Salesse	21	3630	28·8
Verrières	27	266	22·9	Casternaudary	...	610	15·6
Toulouse (Canal Office)	12	491	23·4	Carcassone	31	369	27·2
Muret	3	541	25·8	Limoux	...	538	20·1
Aurignac	2	1070	16·8	Quillan	...	...	26·1
Montréjeau	34	1549	39·5	*Appendix, Mediterranean,*			
Bagnères-de-Luchon	8	2044	42·3	Sallèles d'Aude	...	39	21·7
St. Girons	30	1316	24·1	Narbonne	...	43	19·7
Couflens	26	2343	29·2	La Nouvelle	20	30	17·5
Boussenac	25	3176	60·1	Perpignan (Norm. Sch.)	...	...	20·4
Le Fossat	30	816	29·9	,, (Mil. Hosp.)	...	...	17·5
Le Mas-d'Azil	36	994	32·5	Amélie-les-Bains	...	...	31·1
Royat	30	873	24·0	Montpellier (Faculty of Sciences)	...	...	28·3
Foix	46	1306	34·5	,, (Bot. Gard.)	3	97	30·4
Ax	43	2405	30·5	*Appendix, Alps.*			
Mirepoix	30	1020	24·7	Genève	..	1335	28·2
Belesta	46	1650	31·9	Grand St. Bernard	...	8173	43·7
Aurillac	...	4394	43·9				
Saint-Flour	...	2898	27·1				

THE YORKSHIRE RAINFALL.

To the Editor of the Meteorological Magazine.

DEAR SIR,—I observed with some surprise that the rainfall recorded on the 29th August at those places where the floods were most severe scarcely exceeded, if at all, the fall measured here, where there was little or no flood. A gauge 6 in. above ground measured 2·11; another at 1 ft. 2·05, and a third (12 in.) at 5 ft. 1·91, between 9 a.m. on the 29th, and 9 a.m. on the 30th; but between 7 a.m. on the 29th, when the rain began, and 7 a.m. on the 30th, the fall at 6 in. from the ground was 2·4 in. The rain was less heavy in the west, and even in Borrowdale, where I was at the time, could not, I should fancy have much exceeded an inch.* This accounts for the river being but little swollen here. Indeed it is so noticeable that the rise and fall of the river depends very little on the fall of rain in this neighbourhood, that the people here have invented a theory that it is caused by the wind blowing on Summerwater, a small lake in Wensleydale. The real reason, I suppose, is that the rains in the level country, and on the moors among which the Ure rises, do not occur always at the same time. A warm southerly wind meets the cold hill tops, and causes a very heavy fall, while here where there is no such condenser but little rain falls. This was the case remarkably in September, 1865, when a very warm moist wind arose on the 9th, and a fall of 6 in. at Seathwaite, and 2 in. at Arncliffe took place, while here the fall was only 0·07, which fell in a gradual drizzle. On the other hand, when a *north wind* furnished the condenser, more rain was extracted out of the warm air of the level parts than from the colder air of the mountains. The result may be tabulated:—

	S. wind.	*N.E. wind.*
Hills (Arncliffe)	2 in.	1 in.
Level Country (Ripon)	0·07 in.	2 in.

I may mention that during the last four months 17·33 in. have fallen here, the fall exceeding 4 in. each month, which is more than I ever knew before—the fall in 1860 having been only 16·7 for the corresponding period, June to September.

Ripon, October 13th. I am, Sir, &c., F. W. STOW.

* Seathwaite, 0·44 in.—*Ed.*

RAINFALL IN OCTOBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which .01 or more fell.
			ft.	in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	2·32	— ·28	·89	18	14
II.		Staplehurst (Linton Park)	0	6	296	1·38	—1·72	·34	18	11
,,		Selborne (The Wakes)	4	0	500 ?	1·66	—2·55	·47	24	10
III.		Hitchen	2	0	240	1·54	—1·01	·52	19	11
,,		Banbury	7	0	345	2·06	— ·37	·56	22	11
,,		Wisbech	0	6	10	1·37	...	·30	22	11
IV.		Bury St. Edmunds (Culford).	1	2	...	·54	—2·18	·10	18 & 27	8
V.		Calne	0	11	250	2·07	...	·64	21	11
,,		Plymouth (Goodamoor)	0	2	580	2·85	—3·82	·64	14	9
,,		Barnstaple	0	6	31	2·13	—1·99	1·03	25	13
,,		Taunton (Fulland's School)	1	4	...	1·90	—1·64	·54	22	15
VI.		Shrewsbury (Highfield)	5	6	200	1·61	—1·27	·53	22	10
,,		Tenbury (Orleton)	0	9	200	2·66	— ·57	1·02	25	15
VII.		Leicester (Wigston)	0	6	220	2·40	— ·30	·85	23	10
,,		West Retford	0	6	50	...	...	...	...	...
,,		Derby	5	0	180	2·95	+ ·11	1·00	18	12
VIII.		Manchester	2	7	106	2·52	—1·29	·52	24	13
IX.		York	0	6	50	1·87	— ·65	·74	25	14
,,		Skipton (Arncliffe)	3	0	750	4·46	—2·20	1·30	29	11
X.		North Shields	1	0	124	1·58	—1·70	·61	22	14
,,		Borrowdale (Seathwaite)	1	0	422	9·62	—6·70	6·00	29	11
XI.	WALES.	Abercarn	1	3	450	3·74	...	1·07	24	11
,,		Haverfordwest	2	0	60	2·74	—2·45	·59	25	9
,,		Rhayader (Cefnfaes)	2	0	880	3·14	—2·46	·70	25	14
,,		Llanberis (R. Victoria Hotel)	1	0	370	3·88	...	1·22	23	10
XII.	SCOTLAND.	Dumfries	0	5	70	2·39	—2·53	·97	18	12
,,		Hawick (Silverbut Hall)	4	0	512	1·28	...	·42	29	15
XIV.		Ayr (Auchendrane House)	2	3	94	2·65	—2·30	·82	29	11
XV.		Otter House	0	6	130	...	...	..	...	...
XVI.		Leven (Nookton)	0	6	80	1·89	—1·86	·51	18	15
,,		Stirling (Deanston)	0	0	130	3·28	—1·63	·86	18	15
,,		Logierait	1	0	250	3·21	...	1·00	18	14
XVII.		Ballater	0	10	656	2·08	...	·64	29	14
,,		Aberdeen	4	8	115	2·65	...	·44	31	17
XVIII		Inverness (Culloden)	3	0	104	1·94	...	·64	31	11
,,		Fort William	0	8	20	6·85	...	1·82	29	18
,,		Portree	0	4	60	7·78	—3·00	2·26	31	15
,,		Loch Broom	0	8	48	3·19	...	·87	31	13
XIX.		Helmsdale	1	0	34	2·01	...	·62	31	16
,,		Sandwick	2	0	78	2·76	—2·16	1·02	28	17
XX.	IRELAND.	Cork	6	0	65	3·21	...	1·04	17	16
,,		Waterford	4	0	60	2·60	—1·80	1·29	17	13
,,		Killaloe	5	0	128	2·44	—2·58	·56	26	14
XXI.		Portarlington	9	0	236	1·73	—3·40	·33	14	14
,,		Monkstown	0	6	100	2·74	—1·18	1·06	17	12
XXII.		Galway	6	0	25	2·60	...	·46	23 & 29	17
,,		Bunninadden (Doo Castle)	1	0	...	2·10	...	·67	17	15
XXIII		Bawnboy (Owendoon)	1	3	218 ?	3·49	...	1·10	17	14
,,		Waringstown	0	4	191	2·06	...	·62	17	10
,,		Strabane (Leckpatrick)	0	5	260	2·35	...	·53	17	15

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—So dark from 9 to 10 a.m. on 16th as to require gas; dense fog on 27th.

LINTON PARK.—First 17 days fine, dry, and bright, contrasting strongly with September; the remainder changeable—winds, fogs, and hazy showers, alternating with now and then a fine day; no heavy rain, bar. very unsteady; frosts on 15th, 16th, 27th, and 29th, but not severe enough to do any harm. No high winds, nor any thunder; the nights very dark when there was no moon.

SELBORNE.—Winds very variable, but for the first half of the month the N.E. most prevalent; afterwards S.W. till 26th. Hoar frost on five nights; Fog on 27th; only ·04 of R prior to the 16th; fog from 1st to 9th inclusive. Max. temp. 65° on 3rd; min. 28° on 16th and 29th. Aurora on 10th.

BANBURY.—Max. 62°; min. 32°·5; only ·03 in. of R prior to 17th.

WISBECH.—Hoar frost on 15th and 16th. Lunar halo on 23rd. The month generally was calm, dull, and foggy; there was a strong wind on one day only (the 30th), and the bar. seldom below 30 in.

CULFORD.—Max. 68° on 2nd; min. 22° on 14th and 15th, the frost making sad havoc with such things as French beans, dahlias, &c.

GOODAMOOR.—Max. 68°, min. 30°; no R from 1st to 13th.

TAUNTON.—Heavy mist on 3rd; frost on 13th. Only ·07 in. of R prior to 14th.

SHREWSBURY.—Only ·01 in. prior to 15th.

ORLETON.—Only ·02 in. prior to 14th. Rainbow at 9 a.m. on the 11th. The first half of the month was dull, damp, and cloudy, with no R and scarce any sunlight. After the 17th a large amount of R fell, especially on the 24th, when the brooks were flooded more than they have been all the season, but there were a few bright days at intervals. Max. 63°·4 on 19th; min. 29°·5 on 16th. No T or L.

WIGSTON (Leicester).—The character of the month has been foggy, overcast, and cheerless, though there was only ·10 of R till the 19th.

ARNCLIFFE.—The early part of the month remarkably fine; scarce any R till the 17th. Max. 59° on 1st; min. 28° on 16th.

NORTH SHIELDS.—Fog on 1st, 2nd, and 3rd.

SEATHWAITE.—No rain on first 15 days. The month chiefly remarkable for the tremendous downfall of 6·00, on the 29th; this fall has only been exceeded on three occasions during the 22 years the gauge has been in use. The fall at the Stye for the month is 15·21 in.; computing the fall on the 30th by comparing this with the total at Seathwaite, we have for the Stye gauge the enormous quantity of 9·48 in., the whole of which fell between 4 p.m. on 29th and 9 a.m. on 30th. So high a flood has not occurred in living memory.

WALES.

ABERCARN.—The month has been rather fine, the temp. being about that of September, and nearly all the rain falling between the 17th and 24th; wind easterly for the first fortnight.

HAVERFORDWEST.—First fortnight cloudy, calm and mild; afterwards a period of broken weather, wet and very stormy, particularly the 28th and 29th, when it blew a heavy gale; slight frost towards the end, but on the whole a fine month, the rain falling principally at night.

CEFNFAES.—Max. 63°; min. 24°. A mild and damp month; leaves falling so early that their autumnal beauties could scarcely be enjoyed.

SCOTLAND.

DUMFRIES.—The weather dry for the first twelve days, and favourable for the close of harvest, though sometimes hazy; on the 15th, 16th, and 17th, sharp frost nipped dahlias and other flowers; the 18th a very wet and stormy day. The latter half of the month showery, but on the whole not unseasonable. The night temp. nearly 5° above last October, and the average for the month 2°·7 higher. The potatoe crop in some places little or no disease, in others a fourth to half; on the whole the proportion of sound tubers considerably above the average crop.

SILVERBUT HALL, HAWICK.—Farmers busy from the 7th to 20th leading their

corn. Green peas gathered daily. Fishers all very busy on 30th. Dahlias, verbenas, geraniums, and many tender annuals, are still blooming beautifully, and might make a coronet fit to adorn the brow of Autumn.

AUCHENDRANE.—Max. 66° on 1st and 17th; min. 27° on 26th. Frost on 7 nights; the winds have been chiefly from the south and moderate, with frequent calms, and a large amount of cloud. Driest October since 1856.

NOOKTON.—Weather calm and mild for the season.

DEANSTON.—Max. 62°·5 on 19th; min. 23°·5 on 26th. Very high wind on 29th. Grain crops got in by the middle of the month, but in bad condition. Though not much R fell in the early part of the month, yet there was little or no wind, and the air was dull, and damp with heavy dews and haze. Some disease of potatoes is noticed, but not to a great extent. No thunder.

LOGIERAIT.—A fine month; strong sunshine from 5th to 10th; frost on the morning of 25th.

BALLATER.—Lunar halo on 21st. The first few days were remarkable for a continuance of dense fogs, with easterly airs or calms, with a very high bar. Max. temp. 67°·5 on 6th; min. 23° on night of 25th. Aurora on 7th.

ABERDEEN.—The month has been much more damp, warm, and quiet than the average, and a most unseasonable one for the harvest, a considerable portion of the crops being still out. Bar. above the average. Aurora on 7th, 9th, and 13th.

CULLODEN.—Only ·27 in. of R prior to the 27th. Fogs in the early part of the month. Hail on 28th.

ROSSE PARSONAGE, FORT WILLIAM.—Aurora on 3rd. The early part of the month was unusually fine and warm. On the night of the 13th a good deal of snow fell on the hills, and Ben Nevis was covered more than half way down. The latter part of the month was very wet, a greater amount being registered by me on the 29th than on any day in the two years during which observations have been taken here.

PORTREE, ISLE OF SKYE.—As I anticipated, October has proved a fine harvest month—the weather being fine till the 19th, the crops were secured in fine condition; after that date, wet and stormy, the 31st being the wettest day of the season, it having rained 13 hours without intermission. Scarlatina is still on the increase, and many deaths have occurred therefrom.

LOCHBROOM.—From the 1st to the 12th fine, dry, harvest weather; thence to 16th very changeable—cold, damp, and snowy on the heights; frosty at night till the 21st; fine, dry, and windy to the 26th; changeable, with snow and sleet, thence to the end, every sort of bad weather, high winds prevailing, especially on the 28th to 29th from the N.; the last day a constant downpour for 24 hours, though not heavy. The month, on the whole, till the 26th, favorable for the farmer and grazier, enabling the former to gather in the remainder of his crops, to give air and sunshine to that which had been harvested under less favorable weather, and to lift his potatoes in a capital state; it also enabled the grazier to prepare his flocks and herds for the winter.

SANDWICK.—October has been a fine harvest month, drier and milder than usual—indeed, the driest October on record, except 1856, and it was as dry as that till the 27th, 0·80 in. only having previously fallen; 1·96 fell on the last 5 days; the temp. was 1°·4 above the mean of the previous 39 years. Aurora on 5 nights; lunar halo at midnight on 22nd; gale on 17th from 6 a.m. all day, averaging 40 miles an hour. Bright meteor, shooting N., 6.30 p.m. on 5th; T & L on 29th.

IRELAND.

KILLALOE.—The smallest rainfall in October for 20 years, except three, viz :—1850=2·07; 1856=1·89; 1859=2·15.

MONKSTOWN.—The first 12 days very heavy, damp, and foggy, the 3rd, 7th, and 9th particularly so; no rain fell during that time. The absence of ozone during the first 16 days was very remarkable. On the 17th rain set in, and from thence to the 26th (on which there was a heavy gale), 2·25 in. fell. On the nights of the 24th and 25th, the ther. fell to 27° and 26° respectively. On the 24th, at 5.15 p.m., while still daylight, a bright meteor was seen, first a pale yellow, then changing to blue, it passed slowly from S.E. to E.; it was considerably brighter than Jupiter.

Doo Castle.—No rain till the 12th; generally speaking the first half of the month was calm, dull, and foggy—the remainder wet. Frosts on the 9th, 13th, 16th, 25th, and 26th. The months of September and October of 1866, as compared with those of 1865, have reversed themselves in the quantity of rain fallen.

Owendoon.—The very seasonable weather of the first 16 days of this month have been of the greatest service to the country, and enabled the harvest to be at length secured. A *very* heavy fall of rain at 7 p.m. on 21st.

Waringstown.—Fine and seasonable; sharp frosts on the nights of the 15th and 24th.

Leckpatrick.—Winds easterly to the 11th, S.E. to 22nd, then shifted to south. Very dry beginning of the month; only on one occasion during the year were there so many days without rain—Oct. 1st to 12th, and July 14th to 26th. Frost on grass on six nights.

Rainfall on October 29th.—Mr. Fletcher's remarks on the Seathwaite return may be supplemented by a few words on the weather at other stations on that day, and on the narrow strip within which alone the fall was unusual—a strip extending along the west coast from Wales to the Hebrides, but only in places even of this strip did the fall assume unusual intensity. Mr. Crosthwaite was in Borrowdale, and reports the floods such as to render the roads impassable for some hours; yet at Keswick he only had 2·07 in., and at Grasmere and Llanberis the fall is returned as under an inch. At Fort William and in the Isle of Mull nearly 2 inches fell. The weather was at *Abercarn* squally from S.; *Haverfordwest*, heavy gale; *Hawick*, strong winds; *Ballater*, red sunrise, then clear, blew hard afterwards; *Culloden*, wet and stormy in evening; *Portree*, heavy westerly gale from 1 to 8, a.m., with hail; *Lochbroom*, gale from N.; *Orkney*, thunderstorm.

LATEST INTELLIGENCE.

The Predicted Meteor Shower.—The accounts which are coming in abundance from all parts of the country bear uniform testimony to the magnificence of the display; and we find that the time of maximum indicated by the following letter differs only two minutes from that given by Mr. Hind, at Twickenham:—

TO THE EDITOR OF THE TIMES.

Sir,—Perhaps you may deem the subjoined statement of the number of meteors noted by me last night worth a corner in *The Times*.

Your obedient servant,

136, Camden-road, N.W., Nov. 14. G. J. SYMONS.

METEORS COUNTED IN PERIODS OF FIVE MINUTES EACH, THE EYES BEING DIRECTED CONSTANTLY TO LEO.

	Time of Watching. h. m.			No. of Meteors.
Nov. 13	11.45 p.m.	to	11.50 p.m.	17
Nov. 14	0. 0 a.m.	to	0. 5 a.m.	21
	0.15 ,,	,,	0.20 ,,	41
	0.30 ,,	,,	0.35 ,,	83
	0.45 ,,	,,	0.50 ,,	87
	1. 0 ,,	,,	1. 5 ,,	264
	1.15 ,,	,,	1.20 ,,	276
	1.30 ,,	,,	1.35 ,,	141
	1.45 ,,	,,	1.50 ,,	60
	2. 0 ,,	,,	2. 5 ,,	48
	2.15 ,,	,,	2.20 ,,	25

	Time of Watching. h. m.			No. of Meteors.
Nov. 14	2.30 a.m.	to	2.35 a.m.	25
	2.45 ,,	,,	2.50 ,,	20
	3. 0 ,,	,,	3. 5 ,,	26
	3.15 ,,	,,	3.20 ,,	20
	3.30 ,,	,,	3.35 ,,	16
	3.45 ,,	,,	3.50 ,,	12
	4. 0 ,,	,,	4. 5 ,,	16
	4.15 ,,	,,	4.20 ,,	12
	4.30 ,,	,,	4.35 ,,	8
	4.45 ,,	,,	4.50 ,,	4

Remarks.—Meteors most numerous at 1.12 a.m., when they were falling at the rate of 100 per minute—in fact, the sky was scored in all directions with their trains; the largest was not twice the apparent brilliancy of Sirius; the trains were, in some instances, visible in a 2½-in. telescope for two minutes. From 2 to 3 a.m. the meteors were not so large as before and after that hour, nor did they appear so uniform in direction,—two passed in parallel lines, but opposite directions. No lightning was seen unless it was at 0h. 35m., when two flashes of light were seen, but they were supposed to be from meteors in the north. I estimate the total number visible at about 7,000 or 8,000.—G. J. S.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XI.] DECEMBER, 1866. [PRICE FOURPENCE, *or 5s. per ann. post free*

THE METEOR SHOWER OF NOVEMBER 13TH-14TH.

Properly to describe the beauteous display of the memorable November night is no easy task, and one we would gladly avoid, but many missed the sight, and for their sakes and also perchance for future reference, we make the attempt. The air was clear, crisp, and bright, as if borrowed from December or January—in fact, as free as possible from all the ordinary attributes of November weather. Traces of cloud on the northern horizon, but otherwise cloudless; in the N.E. there was a faint glow of light (auroral like), until about 2 a.m.; temperature 41°; the ground as firm as if frozen; these the atmospheric conditions. Watch was kept at Camden Town, at intervals from 9 p.m., but no meteors were seen until 11.13 p.m. At 11.45 p.m. regular counting was commenced with the results mentioned on p. 90, and shown in the accompanying diagram. The total number counted between 11.45 p.m. and 4.50 a.m. was 1222, but as they were only counted during 5 minutes out of each quarter hour, the number must be tripled to reach the number which continuous counting would have given—viz., 3666; addition must also be made for those hidden by cloud (from 12.30 to 1 a.m.), and for those which escaped counting at the time of maximum frequency (1.10 a.m.)—perhaps 5 per cent.—we then get nearly 4000 for the portion of the sky watched, and we shall probably be considerably under the truth if we put the total number visible at 8000—more than half of them appearing between 1 and 1.45 a.m., while at 1.12 a.m. they averaged quite 100 per minute. At this time, the constellation Leo, whence almost all the meteors radiated, was well out of the mist in the horizon, and was dotted with balls of light with tails so foreshortened that they seemed but elongations of the head, while around, as from a fiery crown, meteors mostly more brilliant than Sirius (which was shining in the west) darted north, south, and west—their bodies mostly white as the ball of lime in an oxy-hydrogen lamp, their tails always brightest in the middle of the track and generally invisible close to the head. Several remained visible long enough for the telescope to be turned to them, and careful remarks made on their apparent structure; usually they were much wider in the middle than elsewhere, and on two occasions were observed to bend before they faded from sight; it looked as if they were heavier in the centre, or as if a gust of wind had swept across their track. Most of the trains were tinged with green, but purple and other tints were by no means absent, the resultant beauty when (as was often the case) two or three differently tinged trains were visible in close proximity was extreme.

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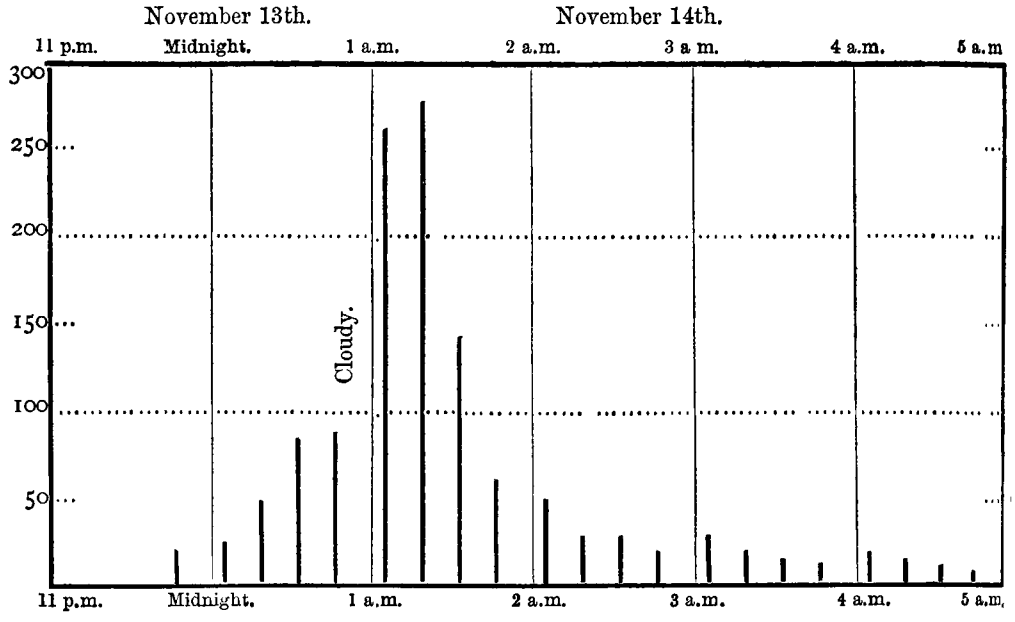
Number of Meteors counted in periods of 5 minutes each, the watch being kept constantly towards Leo.



NOTES ON THE METEOR SHOWER.

ENGLAND.

TWICKENHAM (*J. R. Hind, Esq.*)—Number of meteors, from midnight to 1 a.m., 1120; 1 a.m. to 1 h. 7 m. 5 sec. 514 were counted, and many more visible; at the latter moment there was a sudden increase, which rendered enumeration impossible; after 1.20 a decline became perceptible; from 1.52 to 2.9, 300 were registered; from 3.9 to 3.24, 100; from 4.42 to 5, 12; and from 5.45 to 6, only 5. Maximum frequency at 1.10 a.m.

PRIMROSE HILL (*Mr. Crumplen*).—Large meteors very abundant shortly after 10, the number rapidly increasing for the next three hours; between 0.25 and 0.35 421 were counted (two observers), afterwards many more; from 2.7 to 2.17 only 149. Some trails visible 10 minutes after the head had disappeared; they were mostly of a brilliant pea green colour. Eight of them were observed through a Dollond's telescope 1½ inch aperture, power 30; they were then found to exhibit tremulous motion, and in a few instances, curled themselves up and apparently began to descend. Radiant, R.A. 147°; N.P.D. 66°.

LONDON.—About 1.15 a meteor, starting nearly from the horizontal line of stars in Orion, crossed the sky towards the west, and as generally the case with the other meteors, the nucleus first disappeared, after a momentary increase of brilliancy, leaving behind it a long line of train, the centre of which remained bright for some instants; I continued to look at it surprised that it remained so long visible. It appeared then as a streak about the length of two diameters of the sun gradually becoming fainter and more confused, so that I was almost thinking that there might be some nebula accidentally situate behind that part of the sky into which it had dissolved. Still I did not lose sight of it, but after two or three minutes I observed that this remnant of the meteor was slowly going lower in a line rather inclined to the west, but nearly coinciding with its meridian. At last it disappeared entirely, after having travelled during ten minutes a length of two or three diameters of the sun.

COVENTRY—(*W. W. Tyler, Esq.*)—From 10.30 to 12 counted 30 meteors; from 12 to 1, 250; just before I counted 800 in 15 minutes; after that it was impos-

sible to count them, 8, 10, or 20 being visible at once ; trails either blue or green ; the head usually became extra brilliant at the moment of extinction. Sky clear, with occasional rain clouds.

PRESTON—(*Mr. T. Aspden*).—Occasional heavy hail showers and strong wind, but the meteors were well seen through gaps in the clouds ; the grandest display was at 1.10 a.m.

PUTNEY—(*Dr. Phipson*).—First meteor seen at 9.20. Out of many thousand meteors, only 5 were noticed which did not accord with a radiant in Leo.

DOVER.—Began soon after 10 p.m.; most numerous about 1; decreased rapidly by 2, after which it was cloudy. Lightning in N. all night. Often several meteors visible at once, running in parallel lines of various colours.

LEICESTER.—Stormy night ; lightning and rain. Meteors very numerous as seen through gaps in the clouds.

NOTTINGHAM.—Cloudy with rain till 12.30 ; sky then cleared, though thunder and lightning continued. Very brilliant display ; like a luminous fountain.

LIVERPOOL.—Overcast with a furious storm, but the sight was well seen at intervals when the clouds broke.

SOUTHAMPTON.—The star shower lasted from 11.30 p.m. to 6 a.m.

WEYBRIDGE—(*B. Scott, Esq.*)—Four inexperienced counters noted between 11.15 and 11.25, 9; 11.25 to 11.30, 13; 11.30 to 11.37, 23; 11.37 to 12.0, 89 ; 12.0 to 12.30, 452 ; 12.30 to 12.45, 795 ; 12.45 to 12.47, 152 ; after this, it was impossible for us to count them. Between 1 and 2 a.m., the singular phenomenon was noticed of two meteors approaching each other so closely as to become involved in mutual attraction, and they passed out of sight revolving round each other (like partners hands across in a country dance) describing spirals of light. Our impression was that even during the fullest flow the stream of meteors did not run evenly, but fitfully, as it were in waves.

GLOUCESTER.—First seen about 11 p.m.; cloudy afterwards till about 1 a.m., whence till 2 the display was magnificent.

WEYMOUTH—(*G. Bishop, Esq.*)—Maximum at 1 a.m.

CLIFTON—(*Dr. Burder.*)—Overcast for 15 minutes between 12 and 1 a.m.; at other times thin haze, but generally cloudless throughout the night. No meteors till 11 p.m.; number increased rapidly about 1 a.m., and the maximum was reached at 1.5 a.m. Between 1.5 and 1.7 81 were counted in one half the sky ; between 1.11 and 1.20 200 were counted, from 1.22 to 1.31 200, mostly about the apparent size of Sirius ; the trains mostly of a delicate greenish hue and strikingly phosphorescent. Radiant on a line between gamma and mu Leonis, 3° from gamma and 5½° from mu.

MILLAND, LIPHOOK, HANTS—(*Rev. J. M. Heath*).—"At about half-past one o'clock this morning, my attention was attracted to a meteor brighter than the others which were showering over the sky, and which was passing nearly in a line from Castor and Pollux to the Pleiades. This meteor left a trail behind it, as did many others also ; but this trail did not rapidly disappear, as most others did, but remained distinctly visible for an unusually long time. I estimate the time it lasted as about three or four minutes. During all this time I distinctly saw that it was revolving about an axis within itself. It had thus revolved through more than a right angle before I lost the power, from its faintness and the alteration of its shape, of saying what its direction was. When I first suspected that it was revolving, it pointed directly to the Pleiades ; before that, therefore, it must have pointed to the west of them. I then distinctly watched it, and saw it move in the direction contrary to that of the hands of a clock until it was at right angles to its first position, and it remained visible for some time after that. During all this time the shape was undergoing alteration. What was at first a band of nearly uniform breadth, tapering only towards the extremities, gradually became thicker in the middle as it shortened itself, and had the shape of a section of a lens."

WROTTESLEY (*Mr. Hough*).—The colour of the trains was generally greenish blue.

WISBECH.—(*S. H. Miller, Esq.*)—Fine meteoric shower (observations interrupted at 1.10 a.m. on 14th by a storm, wind 5lbs. pressure); total counted, 1157.

CALNE.—(*Col. Ward.*)—Brilliant display of meteors on 14th ; lightning in S.E.

GOODAMOOR.—(*H. H. Treby, Esq.*)—The early part of the night (13th) was cloudy, with showers, but after midnight it cleared in time to see the predicted shower of meteors, a sight not new to me, having been so fortunate as to have seen the one of Nov. 1833, at about one o'clock in the morning of 13th, they were so numerous and fell so fast, that I could not pretend to count them; they seemed to prevail most in the north-east part of the heavens. Many persons doubted my story, thinking it an after-dinner vision, as it was on my return from a party at Newnham Park in this parish, on horseback, that I saw them; it was most wonderful and not to be forgotten by me.

PENZANCE (*The Times*).—Meteors most abundant about 1 a.m., when the wind was strong from the N. Very few fell towards the horizon. The succeeding night was cloudy till after 2 a.m.; after that hour it is reported to have cleared and "revealed the same effects as on the preceding night."

OXFORD OBSERVATORY (*Rev. R. Main*).—Maximum frequency at 1·24. In one particular instance the train of a meteor was visible for some minutes; this was the train of a bright meteor which disappeared in the belt of Orion, leaving the train apparently attached to Zeta Orionis, and giving to that star the appearance of a comet with a tail of nearly 3°, standing out at a position angle of nearly 135°. It then detached itself from the star, keeping up the same route as the meteor, but forming itself into a ball of faint cometic appearance of about 15′ diameter, which grew dimmer and more diffused, and disappeared altogether after a lapse of about 4m. to 5 m. at a distance of nearly 1° from Zeta Orionis, at a position angle of about 200°. This meteor appeared at the time of the greatest display, at 13h. 24m. Only in two instances meteors were seen to burst, one in the east and another in the north.

HULL (*W. Lawton, Esq.*)—Am informed several meteors were seen on the previous day (about 3 a.m. on 13th) through a gap in the clouds. About the time of maximum, 1.10 a.m., the number was between 100 and 200 per minute. The next night and morning (14th-15th) the sky was cloudless, but no meteors were seen.

GREENSIDE MINES, PATTERDALE.—(*Mr. J. Barningham.*)—On 13th November about 7 p.m. I was astonished with a glare of light as if by an explosion of gunpowder, sufficiently light to read by; on turning round my face to the S., I saw N.E. of the constellation the Great Bear, a long train of light about 4 yards long; but the most brilliant light only lasted 2 seconds. Many bystanders saw it with cries of astonishment.

WEYMOUTH (*Dr. Allnatt*).—Splendid display; slight crackling sound, perhaps due to the rippling of the tide.

ALDERSHOTT (*The Times*).—A letter from L.G.M., referring to the remark of Dr. Allnatt as to sound, states that it was distinctly heard by the writer and a friend.

WELLINGTON COLLEGE (*R. Granville*).—Heard the same sound as Dr. Allnatt, in the quadrangle of this college, at intervals between 1 and 2 a.m.

[The above are the only intimations of sounds having been heard, and singularly enough two are from the same neighbourhood, while the other is not positively affirmed. The contrary assertion of absolute silence is so frequent that a list of places would be wearisome.—ED.]

WALES.

CARDIFF (*Messrs. Thompson*).—At 1.8 a meteor three times the apparent size of Jupiter, shot from Castor through the Pleiades, purple nucleus, train some minutes broad, at first quite straight; a part about 15° long near Aldebaran remained visible after the ends had faded, and assumed a serpentine form, afterwards took the form of a small oval cloud and moved from Taurus towards Orion, being visible as a faint cloud until 1.20, or 12 minutes from its first appearance.

ABERCARN.—(*Rev. D. Charles.*)—The remarkable shower of meteors was observed here on the 13th. It commenced at midnight and continued until 3 a.m.; the maximum being about 1 a.m. (14th) when there appeared a real shower of fire. From a reckoning made at the time, it was calculated that 20,000 must have fallen within the circle of our horizon.

HAVERFORDWEST.—(*E. P. Phillips, Esq.*)—On the night of the 13th, a little after midnight, the sky clear, and gale from N.W., the splendid phenomenon of the

meteors was well seen ; they appeared to pass with amazing rapidity and in countless numbers from S.E. to N.W. in direct opposition to the gale. They were visible till 4.30 a.m.

SCOTLAND.

BALLATER, ABERDEEN (*J. W. Patterson, Esq.*)—Meteors first observed about 11 p.m., but "after midnight the sight was really wonderful, there being a constant succession of them all across the heavens (like the file-firing of a company of riflemen but without the noise)." About 2 a.m. the sky became overcast with heavy rain.

GLASGOW (*A. S. Herschell, Esq.*)—Number of meteors seen per minute by one observer, watching half the sky—at 12.15, 2 ; 12.45, 12 ; 1, 25 ; 1.10, 56 ; 1.20, 57 ; 1.24, 43 ; 1.30, 30 ; 1.35, 21 ; 1.45, 5 ; 2, 1. Meteors mostly white or orange, their streaks emerald green. "Large meteors appeared at 12.33, 12.41, 2.14, and 2.42, they left streaks which endured from 5 to 14 minutes ; each of the eccentric streaks contracted itself into a knot of light, which drifted, cloud-like, 8 or 10 degrees before it vanished. The last presented an imposing ring of flame 3 or 4 degrees in width ; it remained visible for 14 minutes, gradually expanding itself into a heart-shaped loop, until it enclosed the chief stars of Ursa Major in a wide fantastic wreath before it disappeared."

LOGIERAIT.—(*Rev. G. D. R. Munro.*)—The meteor phenomenon was witnessed in all its splendour between midnight and 2 a.m. (on 14th); at times the whole heavens seemed as if lighted up, countless meteors shot along the sky in all directions though generally the course was westward from Leo ; at times they appeared as if in pairs, and after running in parallel lines would diverge. Many were seen to burst, giving forth exquisite shades of color ; the sky was cloudless throughout. Though carefully listened for, no sounds were heard.

ABERDEEN.—(*Rev. A. Beverley.*)—Magnificent meteors seen by thousands.

IRELAND.

MONKSTOWN.—(*A. Pim, Esq.*)—The meteors were seen from here in great brilliancy on the night of the 13th ; they commenced falling in small numbers about 10.45 ; by 11.15 the number was greatly increased, in 6 minutes, from 12.24 to 12.30, I counted from my window (facing the N.W. and from which I could see about two-fifths of the sky) about 375, or at the rate of 3,800 per hour if continued; the direction of all being from E. to W.; some were of great brilliancy with long trains; at 3.30 a.m. they appeared to have ceased.

FOREIGN.

SPAIN, SARAGOSSA (*J. C. Robinson*).—Sky cloudless ; about midnight a very abundant shower ; all left a well-defined trail of pale bluish sparks ; the heads usually white, but sometimes vivid emerald green, or tinted with pink or crimson.

MEDITERRANEAN, MALTA (*The Times*).—A letter from W.W. gives the maximum display at 1.30 to 2 a.m.

MEDITERRANEAN, MALTA (*J. P. H. Boileau, Esq.*)—Number at the lowest computation, 200 per minute; but it was impossible to count them, it was like a shower of hail. Fifteen sentries were interrogated with a view to determine the duration ; the result being—commencement 1 a.m., maximum 2.30, over about 5 a.m. Only one seen on the following night.

ITALY, ROME.—Father Secchi, Director of the Observatory, is stated to have gone up into the mountains to lessen the chance of his observations being prevented by cloud ; but both there and at Rome the sky was uniformly overcast.

THE METEORIC SHOWER IN AMERICA.—The meteors observed in America were not so numerous as those seen in England. Arrangements had been made in several cities to ring the bells in order to arouse the people if the spectacle should be such as was expected ; but it was not. Professor Loomis, of Yale College, makes the following report :—"On Monday night, November 12, a company of observers at this place counted 696 shooting stars in five hours and twenty minutes, which is about four times the average number visible for the same period throughout the year. On Tuesday night, November 13, another company counted 881 shooting stars in five hours, which is five times the average number. On Wednesday night the sky was overcast, so that no observations could be made. We conclude that the number of shooting stars visible about the 18th was very remarkable ; never-

theless, this display is not to be compared with that of the 13th of November, 1833, in which the number of meteors was variously estimated at from 10,000 to 30,000 per hour. The grand display, therefore, which it was supposed might possibly occur this year has not been witnessed in the United States. . . If we receive no accounts of an unusual display of meteors this week in any part of the world, we shall look with considerable confidence for such a display on the 14th of November, 1867."

INCOMPLETE RAIN GAUGE EXPERIMENTS.

The following paragraph with reference to some desultory experiments at Camden Road, appeared on the cover of last month's Magazine :—

"I may just mention that *at present* there appears to be a considerable increase in the amount collected by gauges whose funnels are of glass and pot—*i.e.*, unoxidisable surfaces, the excess being nearly 6 per cent. ; and that gauges thoroughly protected from evaporation *may* exceed unprotected ones by about the same amount. Therefore (so far as the present observations go), a thoroughly protected gauge, with a permanently smooth surface would, apparently, exceed an ordinary one by nearly 12 per cent.—an enormous difference, and one which needs close scrutiny."

So many inquiries have been made respecting these experiments that I am reluctantly induced to print the results hitherto obtained—reluctantly, because they must, for several reasons be accepted with considerable reservation, and subject to correction, perhaps even to reversal by the better conducted series which will commence from January, 1867, prior to which time these and some other gauges will be placed on the lawn of Frampfield Lodge, Sussex, under the care of my friend, the Rev. T. E. Crallen, who has most kindly undertaken to continue the observations. A few words as to the "shelf gauges" will conclude; they were always all measured with one glass, hence any slight error in it would be common to all, but it is not 20 grains (= 0·004 in.) wrong at any point. The funnels are not at present *perfectly* uniform, but their areas are not sufficiently different to account for the differing indications; they are as under:—

N.W. end of shelf,	diameter	5·000	inches,	therefore area	= 19·64 in.
Glass funnel gauge	,,	5·003	,,	,,	= 19·65 in.
Earthenware ,,	,,	4·987	,,	,,	= 19·58 in.
White Can ,,	,,	4·997	,,	,,	= 19·62 in.
Sand buried ,,	,,	5·000	,,	,,	= 19·64 in.
S.E. end of shelf	,,	5·003	,,	,,	= 19·65 in.

The effect of these variations, amounting only to $\frac{1}{300}$th of the total area, is practically nil. A more serious source of uncertainty is the fact (only recently noticed) that the rims are not all equal in slope, so that possibly the excess caught by the glass and pot funnelled gauges is due in whole or in part to insplashing from their flatter rims. As most clearly showing the results obtained, the observations are entered as differences from a standard in each series, as stated in the table.

Subject to full correction by future and better conducted observations, the results may be thus epitomized. (1) An 8 in. gauge catches 1 per cent. more than a 5 in. gauge, if both are under similar conditions, (2) a gauge measured monthly, if well protected against evaporation, records 4 per cent. more than it would if read daily, (3) a gauge with a glass funnel collects 7 per cent. more than one with a metal funnel, (4) a gauge with a funnel of white earthenware, collects 4 per cent. more than one with a metal funnel, (these results are open to question for the reason stated above), (5) a gauge painted white records rather more (2 per cent.) than one painted black, perhaps because it is less heated by the sun, because (6) a gauge buried in wet sand, and with other provisions against loss by evaporation, exceeds an unprotected one by 5 per cent., and if read monthly, probably exceeds an unprotected one read daily, by about 8 per cent. *All these results must, however, be considered liable to contradiction.*

Conscious that I have not given, have not been able to give, to these observations the care they merit, I have the satisfaction of having broken ground, and the far greater satisfaction of knowing that henceforth they and the questions arising from them, will be in the able hands of Mr. Crallen.

Gauges on, or partly sunk in, the ground. Gauges on a shelf running N.W.,S.E.

Read daily at 9 a.m.&9 p.m.			Read at 9 a.m. 1st of month			Read monthly at 9 a.m. on the 1st,				
1866	8 in. Glaisher's gauge. 6 in. above ground.	5 in. Casella can gauge, bottle, & india rubber collar. 6 in. above ground.	5 in. Casella can gauge, bottle, & india rubber collar. 6 in. above ground.	5 in. Casella can gauge, *no* bottle. 1 ft. above ground.	5 in. Negretti gauge. 1 ft. above ground.	Mean of two gauges, one at each end of the shelf. Black can gauges, no bottle inside.	Black can gauge, no bottle inside, but with a glass funnel instead of a metal one.	Black can gauge, no bottle inside, but with an earthenware funnel instead of a metal one.	White can gauge, no bottle inside.	Black can gauge, with bottle and india rubber collar; it is bedded in a large closed case of wet sand.
April..	1·76	+ ·02	+·09	—·05	+·08	1·68	+ ·15	+·08	—·01	+·03
May...	2·03	— ·02	+·02	—·11	·00	1·83	+ ·22	+·11	+·07	+·13
June...	3·98	+ ·02	+·08	+·01	—·04	3·65	+ ·30	+·13	+·11	+·13
July...	1·19	— ·03	+·04	—·09	—·01	·98	+ ·11	+·09	—·08	+·15
Aug...	2·76	— ·02	+·12	+·02	—·04	2·51	+ ·25	+·17	+·08	+·24
Sept...	3·88	— ·09	+·26	+·26	—·08	3·97	+ ·12	+·09	+·09	+·12
Oct....	2·32	— ·04	—·01	—·12	—·13	2·14	+ ·05	+·06	+·02	+·03
Nov...	1·73	— ·03	—·02	—·23	—·11	1·55	+ ·13	+·06	+·01	+·05
Sums	19·65	—0·19	+·58	—·31	—·33	18·31	+1·33	+·79	+·29	+·88

To the Editor of the Meteorological Magazine.

Barlaston, Stone, Staffordshire, Nov. 29th, 1866.

DEAR SIR,—On the cover of the Magazine for the current month, you say—"There appears to be a considerable increase in the amount collected by gauges whose funnels are of glass and pot—*i. e.*, unoxidisable surfaces, the excess being nearly 6 per cent.," &c.

It may be satisfactory to you to know that my two gauges, placed side by side, one with a funnel 13¼ inches in diameter, made of fine glazed earthenware; the other a metallic Casella's 5 in. gauge, tested by yourself, register practically the same amount, the difference being, *not* 6 *per cent.*, but scarcely *one-hundredth of an inch*, after the heaviest rainfall. I am, therefore, inclined to think that the experiments referred to were not conducted with precision, or that the two sets of gauges were not placed in the same situation. Indeed, I do not see how so great a difference could be accounted for by any difference in the material of the funnels.

I remain, yours truly, WILLIAM SCOTT.

MIGRATION OF SWALLOWS.

Shortwood House, Staines, 19th October, 1866.

DEAR SIR,—The swallows disappeared earlier than I ever remember—viz., on 30th September and 1st October, from this neighbourhood, but more were seen on Wednesday afternoon, the 3rd, when we had a higher temperature, and some were here as late as 13th inst. My observations on this head have led me to believe for some years that these birds keep travelling *southwards*, for a fortnight before they all leave, that those from the *southernmost* parts of the island go first, and that their place is supplied from the midland districts, which are in their turn supplied from the north, and so on till all are gone. This is only theory, yet I am led to believe it, although I once saw swallows flitting about the race-course at Leicester, on 7th November, but I fancy these must have been late hatched birds, which could not encounter the long flight of their parents; this was, I think, ten years since. Three years ago I saw a few martins near Runnymede, on 13th November.

I have not registered a drop of rain this month till yesterday morning, when there was $\frac{1}{15}$ of an inch, and this morning $\frac{2}{3}$=nearly half-an-inch, which fell in twenty hours.

I am, dear Sir, yours faithfully,

HENRY ST. JOHN JOYNER.

RAINFALL IN NOVEMBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground		Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which .01 or more fell.
			ft.	in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0	6	100	1·73	— ·68	·37	10	14
II.		Staplehurst (Linton Park)	0	6	296	1·89	—1·30	·37	13	13
,,		Selborne (The Wakes)	4	0	500 ?	2·08	—1·46	·53	8	14
III.		Hitchen	2	0	240	1·68	— ·46	·42	13	12
,,		Banbury	7	0	345	1·71	— ·49	·43	10	14
,,		Wisbech	0	6	10	2·24	...	·46	10	12
IV.		Bury St. Edmunds (Culford)	1	2	...	2·66	+ ·27	·43	10	12
V.		Calne	0	11	250	2·31	...	·55	12	12
,,		Plymouth (Goodamoor)	0	2	580	4·14	—1·46	1·46	11	17
,,		Barnstaple	0	6	31	3·91	— ·23	·75	11	22
,,		Taunton (Fulland's School)	1	4	...	1·14	—1·96	·45	9	7 ?
VI.		Shrewsbury (Highfield)	5	6	200	2·25	+ ·27	·42	8	17
,,		Tenbury (Orleton)	0	9	200	1·66	— ·81	·45	11	18
VII.		Leicester (Wigston)	0	6	220	2·28	+ ·12	·40	11	13
,,		West Retford	0	6	50	...	...	...	...	...
,,		Derby	5	0	180	3·06	+1·43	·42	10	19
VIII.		Manchester	2	7	106	5·72	+2·96	1·24	15	18
IX.		York	0	6	50	2·39	+ ·41	·84	17	15
,,		Skipton (Arncliffe)	3	0	750	9·45	+3·00	2·16	15	19
X.		North Shields	1	0	124	2·23	— ·48	·58	15	13
,,		Borrowdale (Seathwaite)	1	0	422	23·08	+6·41	6·38	16	22
XI.	WALES.	Abercarn	1	3	450	3·41	...	·87	10	10
,,		Haverfordwest	2	0	60	5·24	— ·43	·97	11	10
,,		Rhayader (Cefnfaes)	2	0	880	4·86	+ ·28	1·20	12	17
,,		Llanberis (R. Victoria Hotel)	1	0	370	8·70	...	1·87	15	20
XII.	SCOTLAND.	Dumfries	0	5	70	4·07	+ ·85	·87	15	21
,,		Hawick (Silverbut Hall)	4	0	512	3·38	...	·74	1	17
XIV.		Ayr (Auchendrane House)	2	3	94	6·17	+2·10	1·09	15	23
XV.		Otter House	0	6	130	...	...	...	...	...
XVI.		Leven (Nookton)	0	6	80	2·12	— ·92	·50	15	10
,,		Stirling (Deanston)	0	0	130	3·35	— ·16	·50	15	17
,,		Logierait	1	0	250	2·76	...	·53	11	16
XVII.		Ballater	0	10	656	1·96	...	·59	15	18
,,		Aberdeen	4	8	115	2·16	...	·42	10	19
XVIII		Inverness (Culloden)	3	0	104	2.64	...	·83	16	8
,,		Fort William	0	8	20	8·40	...	1·45	7	25
,,		Portree	0	4	60	8·10	—2·38	·80	4	27
,,		Loch Broom	0	8	48	9·25	...	·80	13 & 15	28
XIX.		Helmsdale	1	0	34	4·97	...	·69	7	24
,,		Sandwick	2	0	78	8·24	+4·24	1·05	12	26
XX.	IRELAND.	Cork	6	0	65	4·14	...	1·61	30	19
,,		Waterford	4	0	60	2·34	—1·61	·72	10	18
,,		Killaloe	5	0	128	4·77	— ·12	1·00	30	19
XXI.		Portarlington	1	2	236	1·89	—2·03	·40	11	19
,,		Monkstown	0	6	100	1·33	—1·56	·30	10	20
XXII.		Galway	6	0	25	4·02	...	·82	30	22
,,		Bunninadden (Doo Castle)	1	0	...	4·25	...	·64	15	26
XXIII		Bawnboy (Owendoon)	1	3	218 ?	5·46	...	1·36	15	24
,,		Waringstown	0	4	191	2·85	...	·86	15	23
,,		Strabane (Leckpatrick)	0	5	260	5·97	...	1·17	15	27

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.*

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

CAMDEN TOWN.—Thick fog on morning of 10th; heavy R from 9.5 to 9.12 a.m., ·18 in 7 minutes. Lunar halo at 9 p.m., on 17th.

LINTON PARK.—A fine month, the beginning and end particularly so; L on the 2nd, 4th, and 5th; no high winds. Fogs few, and never intense; 12 frosty days, the sharpest being the 21st. Wind mostly W., N.W., and S.W. Bar. very unsteady about 16th and 17th; more settled towards the end. Evenings, when no moon, very dark, but as a whole the past month has been one of the finest on record for November.

SELBORNE.—Remarkable variations of both bar. and ther. from 16th to 21st; bar. on 16th, 28·85; 17th, 29·80; 18th, 29·27; max. ther. on 16th, 50°: 17th, 33°; 18th, 48°; 19th, 33°; and 20th, 32°; max. of month, 55° on 2nd; min. 23° on 20th; aurora on 8th.

BANBURY.—L on the 3rd. Max. 57°·5; min. 27°. Bar. rose more than one inch from 3 p.m. 16th to 9 a.m. on 17th. Fog on 28th.

WISBECH.—The first fortnight dull, the last week fine. White frost on 10th; lunar halo on 17th. Min. 28°·1 on 21st. Fine meteoric shower on 13th; total counted 1157; observations interrupted at 1·10 a.m. on 14th by a storm with L; pressure of wind, 5lbs. T on 24th.

CULFORD.—Max. 58° on 2nd; min. 23° on 9th. Month as a whole favourable for November. Meteors seen on 13th and 14th.

CALNE.—Violent wind and rain in the night of 10th, hard frost, dahlias, &c., killed. Max. 59°·5 on 3rd; min. 23° on 21st. Brilliant display of meteors on 13th, L in S.E.

GOODAMOOR.—A very wet and stormy night on 10th, after white frosts on 9th and 10th. Showery till midnight on 13th, when it cleared and meteors were seen.

TAUNTON.—Max. (in sun) on 2nd, 80°·5; min. on 21st, 29°·5.

ORLETON.—Warm damp month. Snow on 19th and 20th.

WIGSTON.—Weather fine and open, wheat sowing has progressed more auspiciously than could have been expected considering the wetness of the autumn.

DERBY.—An unusual flood (higher than has been known for 25 years) occurred on the 17th, in the low-lying districts of this neighbourhood, and also a portion of the town; the flood mainly attributable to the heavy and continued rainfall north of Derby.

MANCHESTER.—On the 14th and 15th the Irwell rose 25 ft. above its usual level, flooding a great part of Lower Broughton and Salford, and doing much damage; the rainfall of the 5 days preceding and including the 16th exceeded the average for the whole month.

YORK.—The rainfall on the 15th and 16th amounted to 1·34 in. in 30 hours, the average for the whole month being under 2 in. The river Ouse here rose 15 ft. above its summer level, but at Selby, 15 miles lower down, below the confluence of the Wharfe, much damage was done, and the floods in the West Riding were most disastrous.

ARNCLIFFE.—The rainfall on the 15th and 16th was 4·73 in., the average for the month being only 6·45.

NORTH SHIELDS.—15th, 16th, and 17th, rainfall amounted to 1·12 in.; the whole month only 2·23 in., being nearly half-an-inch below the average.

SEATHWAITE.—On 8 days more than 1 in. of rain, one of those days, the 7th, having 2·88 in., and the 16th, the large amount of 6·38 in., approaching very closely to the max. fall in 24 hours, during the 22 years, and having only been exceeded three times. Cumberland has escaped without damage from the prevailing floods, though the fall at some places (the Stye, for instance, 32·65 in.) has been enormous.

WALES.

ABERCARN.—From 1st to 9th fine, mild, and calm; 10th to 16th rainy and stormy; 17th to the end cloudy and foggy, though but little R.

* Notices of the meteor shower are given on pages 92 to 95.

HAVERFORDWEST.—First half of the month wet, damp, gloomy, and at times blowing heavily, particularly on the 12th and 13th. Only three frosty nights during the month; snow on the hills on the 17th and 20th.

RHAYADER.—Weather generally damp and mild, heavy clouds and mists prevailing.

LLANBERIS.—More than 1 in. of rain on three days.

SCOTLAND.

DUMFRIES.—The first half of the month wet and stormy; only one day without rain till the 18th; 19th to 21st frosty and fine; thence to 25th showery; fine to the close of the month. Snow on the hills, on 14th, 16th, 18th, and 25th. The sunrise on the mornings of the 26th and 27th, unusually magnificent.

SILVERBUT HALL, HAWICK.—Falling stars, and high winds, on 6th, 7th. & 8th. Showers of meteors on 13th. On the 15th, about 7, a brilliant white luminous arch was visible for half-an-hour in the northern hemisphere; it spanned nearly a third of the horizon, the stars very dim were seen through it, and although it resembled an arch of the Aurora Borealis, it presented none of its flitting uncertain characters. Rivers full on 15th, and overflowing next day, 1·03 in. of rain having fallen in those two days; gathered green peas on the 5th.

AUCHENDRANE.—The river in high flood during the whole month, but never beyond its banks; highest on the 16th. Max. 58° on 1st; min. 23° on 17th. 24 hours of nearly continuous rain on 14th and 15th. Bar. on 15th at 9 a.m. 29·90; at 9 a.m. 16th, 29·16; and at 9 p.m. on the same day, 29·73.

DEANSTON.—Max. 56° on 1st; min. 22° on 17th; very high winds, on the 5th and 8th; heavy snow on the hills on the 17th, some snow showers on the 19th. Meteoric showers on the night of 14th, very distinct; 2·90 in. of R fell between 1st and 18th.

LOGIERAIT.—A remarkably fine month, notwithstanding stormy days; we had the first and hitherto the only covering of snow this season on the 16th, and from that date to the 20th very keen frosts.

BALLATER.—Lunar rainbow on 23rd. Very little snow this month.

ABERDEEN.—Max. 55°·7 on 1st; min. 27° on 17th. Smart snow showers from 16th to 19th.

FORT WILLIAM.—T about noon on 5th, and strong S.W. gale on 7th and 8th. Much snow fell on the 19th, and the weather for several days was very cold.

PORTREE.—This month has been wet, stormy, and squally, throughout. Gales on the 7th, 8th, 11th, 29th, and 30th. Fog on 10th, 21st, and 28th. 3 in. of snow on evening of 16th; frost on 11 nights. Scarlatina subsiding.

LOCHBROOM.—Without exception the most stormy November remembered by the observer; not one dry day from the 26th of October to the 29th of November, with high winds and gales particularly from the N., but no damage either by sea or land in this locality.

SANDWICK.—The month has been unprecedentedly wet, the rainfall having exceeded that of *any month during the previous 26 years*. Gale on 5th from 1 to 6 p.m., 66 miles per hour, and on 8th 67 miles. A severe T S on 11th, when the L struck a house about 7 miles E. of this, splitting the gable, knocking out the windows, breaking the crockery, and throwing two persons who were sitting by the fire to the other side of the room, without hurting them, though it tore the sole from one of their shoes. There was a sprinkling of snow on the 16th, and a snow-storm on 18th and 19th, followed by a thaw on the 20th.

IRELAND.

MONKSTOWN.—The month commenced warm and showery, but grew very cold towards its close, some of its variations being very remarkable, especially between the 16th and 19th; on 16th, 9 a.m., the temp. was 53°; on 17th, 34°; 18th, 49°·5; and 20th, 36°. Max. 58°·8 on 1st; min. 29° on 9th. Snow stated to have been seen on the Wicklow Hills on the morning of the 17th. A terrific gale on the 30th.

OWENDOON.—The fall on the 15th 1·36 in., the greatest yet observed.

WARINGSTOWN.—Early part of month, wet and stormy; the latter part fine, mild, and genial for the season. Frost on grass on 14 nights. Wind W. and compounds of W. on 26 days.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

XII.] JANUARY, 1867. [PRICE FOURPENCE, *or 5s. per ann. post free*

COLD WINTERS.

THE frost with which 1867 commenced brings again into prominence the desirability of possessing facile means of ascertaining the relation of present temperatures to those of bygone years; to this end we have prepared the following tables. No doubt they contain *some* errors (for people will talk of so many "degrees of frost," and confuse freezing point with zero), but the general accordance of the returns is sufficient to show their probable correctness.

Table I. needs no comment; excepting a few additions, it is as given by Dr. Lindley in the "Transactions of the Horticultural Society," Second Series, vol ii.

TABLE I.—*Temperatures in January*, 1838.

MIDDLESEX...Chiswick	— 4·5	NORFOLK...Norwich	— 3·0
Hammersmith	— 2·0	DEVONSHIRE...Bicton	18·0
Somerset House	11·4	CORNWALL...Carclew	12·0
SURREY...Walton, nr. Claremont	—14·0	STAFFORDSHIRE...Rolleston Hall	5·0
Claremont	—12·0	WORCESTER...Pitmaston	12·0
KENT...Beckenham	—13·5	WARWICK...Birmingham	— 3·0
Greenwich	— 4·0	LANCASHIRE...Liverpool	9·0
Sevenoaks	— 3·0	YORKS...Doncaster	6·0
Redleaf	— 1·0	Wetherby	10·0
SUSSEX...Arundel	9·0	NORTHUMBERLAND..Belsay Castle	10·0
HAMPSHIRE...N. Stoneham	0·0	GLAMORGAN...Sketty Hall	15·0
Isle of Wight, Binstead	15·0	Singleton	15·0
BERKS...Wallingford	— 5·0	LANARK...Glasgow	— 1·0
BUCKS...Dropmore	6·0	DUBLIN...Dublin	20·0
CAMBRIDGE...Cambridge	3·0	Glasnevin	15·0

This frost was evidently most severe in the environs of London.

The next remarkable cold period was Christmas, 1860; of it we have collected, from a variety of sources, the following ample details:—

TABLE II.—*Temperatures in December*, 1860.

MIDDLESEX...Chiswick	— 1·0	KENT...Dartford	1·0
Hammersmith	0·0	Sandhurst	7·0
Enfield	— 1·0	Lewisham	7·0
Hackney	5·6	Greenwich Observatory	8·0
Camden Town	6·7	Sevenoaks	15·0
Regent's Park	10·9	SUSSEX...Hurstpierpoint	3·0
St. John's Wood	11·0	Uckfield	6·6
Whitehall	12·7	Worthing	17·9
Guildhall	14·5	Fairlight	20·0
SURREY...Weybridge	4·5	HAMPSHIRE...Selborne	— 1·5
Cobham	6·0	Heckfield	2·0
Walton	11·0	Petersfield	7·5
Dorking	12·0	Aldershott	8·0
Battersea	10·5	Southampton	11·0

HAMPSHIRE ..Isle of Wight, Ventnor	22·0
,, ,, Osborne	18·9
BERKSHIRE...Newbury	— 6·0
Welford	— 4·0
Moulsford	— 6·4
Englefield	— 2·0
Wallingford	0·0
Maidenhead	5·0
HERTFORD...Ball's Park	—10·0
Tyttenhanger	— 6·0
Cheshunt	— 5·0
Ware	— 5·0
Sawbridgworth	— 2·0
Harpenden	1·0
Hatfield	4·0
Berkhampstead	4·0
Royston	1·1
BUCKS...Taplow	2·0
Stowe	3·0
Westbury	7·0
Hartwell House	10·0
,, Rectory	7·0
OXFORD ..Henley	— 2·0
,,	— 1·0
Rose Hill	1·0
Oxford Observatory	0·0
NORTHAMPTON ..Apethorpe	4·0
Oundle	4·9
Rockingham	6·0
Overstone	8·0
HUNTINGDON...St. Neots	—12·5
BEDFORD...Cardington	3·6
Aspley	13·5
Bedford	6·0
CAMBRIDGE...Chatteris	— 5·0
,,	— 5·0
Ely	— 5·0
Cambridge	— 5·0
,,	— 4·0
ESSEX...Saffron Walden	—12·0
,, ,,	—12·0
Epping	— 5·0
,,	4.0
Colchester	— 4·0
Apington Hall	— 3·0
Bardfield	— 2·0
Chelmsford	— 2·0
Leyton	1·3
Dunmow	4·0
SUFFOLK...Stowmarket	— 4·0
Bury St. Edmunds	— 5·0
Sudbury	— 4·0
Bungay	— 3·0
NORFOLK...Fakenham	—10·0
Long Stratton	—10·0
Diss	— 3·0
Holkham	0·0
Norwich	1·0
WILTS...Trowbridge	2·0
WILTSHIRE...Calne	2·0
DORSET...Upwey	11·5
Little Bridy	16·2
DEVON...Castle Hill	2·0
Dawlish	8·5
Torquay	22·0
Exeter	13·7
,, High-street	15·9
CORNWALL...Bodmin	14·0
Truro	11·0
Helston	18·0
SOMERSET...Langport	4·0
Bath	8·5
GLOUCESTER...Dymock	— 5·0
Highnam	— 4·5
Witcombe	2·0
Stroud	3·0
Clifton	7·1
Sedbury	14·0
HEREFORD...Ross	— 3·0
STAFFORD...Cheadle	—15·0
Rolleston	—10·0
Tamworth	— 7·0
Lichfield	— 6·0
WORCESTER...Eardiston	— 1·0
WARWICK...Atherstone	— 1·0
Birmingham	— 1·0
LEICESTER...Cole-Orton	3·0
Belvoir Castle	— 1·0
Brigg	—11·0
LINCOLN.. Boston	0·8
Grimsby	— 6·0
Alford	3·0
Grantham	3·0
NOTTINGHAM.. Carlton	—12·0
Highfield House	— 6·0
Beeston	— 8·3
Beesthorpe	— 6·0
Worksop	— 6·0
Kingston Hall	— 5·0
DERBY...Chatsworth	—12·0
Willersley	— 6·0
Radbourne	— 3·0
Osmaston	4·0
Derby	2·0
CHESHIRE...Tarporley	— 8·0
LANCASHIRE...Old Hall, Sale	— 9·8
Thelwall	— 6·0
Wilmslow	— 3·0
Manchester	— 1·3
,, Old Trafford	— 3·0
Latchford	— 3·0
Eccles	— 3·0
Wigan	— 2·0
Holker	11·0
Liverpool	11·2
Stonyhurst	16·1
YORKSHIRE...Thorpe Perrow	—12·0
Bedale	—11·0
Doncaster	— 8·0

YORKSHIRE...Wakefield	— 6·0
,,	— 4·5
Bradford	— 3·0
Kirkham Abbey	— 2·0
Coneysthorp	0·0
Grimston	0·0
Leeds	3·0
Castle Howard	4·0
Malton	8·0
,,	— 6·0
Whitby	10·0
Scarborough	16·0
Ben Rhydding	8·5
Sheffield	4·0
Otley	5·0
Harrogate	9 5
York	— 4·0
DURHAM...Sunderland	8·0
NORTHUMBERLAND...Alnwick...	—10·0
NOROHUMBERLAND...Alnwick...	12·0
Hesleyside	— 5·0
Hexham	2·0
Bywell	3·5
Allenheads	8·3
CUMBERLAND...Carlisle	9·0
,,	2·8
Silloth	1·5
Whitehaven	9·0
WESTMORELAND...Kendal	4·0

WALES.

GLAMORGAN ..Merthyrmaur	10·0
PEMBROKE...Pembroke	22·0
CARDIGAN...Lampeter	5·4
BRECKNOCK . Crickhowell	— 3·0
RADNOR...New Radnor	— 3·0
FLINT...Hawarden	8·5
CARNARVON...Conway	18·0

From this it will be seen that the frost of 1860 was general throughout the country—temperatures below zero being recorded at 78 stations, and even —10 (10 below zero) being quite frequent, registered at 14 stations, and these in all parts of the country, except in the South and South-West.

Table III. is as yet very incomplete, but it seems quite sufficient to show how local has been the severity of the late frost; in fact, except in the Thames valley and at isolated stations, it does not appear to have been nearly so severe as in 1860.

TABLE III.—*Temperatures in January*, 1867.

MIDDLESEX...Staines	— 7·0
Winchmore Hill	— 4·0
Hammersmith	— 3·0
Camden Town	6·7
SURREY...Epsom	—12·0
Cobham Lodge	— 3·0
Cobham (Pyports)	— 6·8
Wimbledon	5·0
Walton	0·0
KENT...Maidstone	0·0
Greenwich Observatory	6·6
SUSSEX...Hastings	13·0
Framfield	6·5
HAMPSHIRE...Southampton	4·0
BERKSHIRE...Wantage	3·0
Maidenhead	— 3·0
Cookham	0·0
Old Windsor	4·0
Wallingford	— 5·0
Long Wittenham	6·0
East Hendred	12·0
HERTFORD...Berkhampstead	0·5
BUCKS...Datchet	— 8·0
OXFORD...Dorchester	— 2·0
SUFFOLK...Ipswich	11·0
NORFOLK...Cossey	4·5
DORSET...Bridport	11·0
DEVON...Exeter	9·0
SOMERSET...Street	3·5
GLOUCESTER...Boyce Court	7·0
Clifton	14·1
HEREFORD ..Leominster	3·0
STAFFORD . Sugnall Hall	— 5·0
WORCESTER...Bromsgrove	2·3
WARWICK...Leamington	12·5
Birmingham	12·7
LEICESTER...Leicester	11·0
Wigston	9·0
NOTTINGHAM...Highfield Ho	10·2
LANCASHIRE...Liverpool Obs.	16·3
YORKSHIRE...York	10·0
Hull	8·0
Malton	6·0
Sheffield	15·5
Wakefield	5·0
NORTHUMBERLAND...Chathill	24·0

Table IV. is intended to indicate approximately the lowest point to which a thermometer, 4 ft. from the ground, and fairly exposed in the suburbs of London, has fallen in each year since 1794. It is not so full and complete as we could wish, but we believe the possible

occasional error of 2° or 3° is outweighed by the convenience of knowing approximately (1) that out of 73 years only two have had the temperature below zero—viz., 1796 and 1838; (2) that the temperature on December 25th, 1796, appears to have been the coldest ever recorded in London, it having been only 5° in the Strand, and about 6° below zero in the suburbs; (3) that the temperature may be expected to fall on one occasion in each year to 15°; (4) that the temperature in 11 years never fell to 20°, and (5) that in 1832 and 1863 its lowest was 25°.

TABLE IV.—*Lowest Temperature in each year from* 1794 *to* 1867.
(LONDON AND ITS SUBURBS.)

YEAR.	Somerset House.	London. J. Haydn.	New Road.	Strand Cary.	Probable Minimum.	YEAR.	Somerset House.	Stratford. Howard.	Greenwich Belville.	Chiswick.	Probable Minimum.
1794	22·0			21·0	16°	1831	24·3	18·0	19·0	13·0	17°
5	7·0			7·0	1	2	27·8		21·0	22·0	22
6	4·0	-16·0?	—4·0	5·0	—6	3	27·3		20·5	22·0	21
7	24·5			26·0	18	4	29·2		23·4	24·0	23
8	11·0			11·0	5	5	21·0		17·2	16·2	16
9	17·0			17·0	11	6	17·5		12·6	13·1	12
1800	18·0			18·0	12	7	24·0		16·0	12·2	15
1	23·0			23·0	17	8	11·4		—4·0	—4·5	—4
2	15·0			14·0	9	9	23·7		20·5	17·0	18
3	19·0			19·0	13	1840	21·2		14·6	12·0	14
4	19·0			19·0	13	1	14·9		5·4	6·0	6
5	23·0			21·0	17	2	27·3		23·0	18·0	21
6	26·0	Stratford Howard.	Greenwich. Belville.	25·0	20	3			19·7	16·0	20
7	23·0	13·0	13·0	21·0	14	4			15·6	14·0	17
8	18·0	12·0	15·0	16·0	13	5			6·2	13·0	7
9	20·0	18·0	18·0	21·0	17	6			18·4	11·0	19
1810	14·0	10·0	13·0	18·0	10	7			11·0	19·0	11
1		14·0	14·0	21·0	14	8			16·6	17·0	16
2		18·0	17·0	23·0	17	9			18·3	16·0	19
3		19·0	19·0	22·0	19	1850				14·0	20
4		8·0	14·0	15·0	11	1				16·0	24
5		17·0	15·0	19·0	16	2				15·0	25
6		5·0	6·0	12·0	5	3				7·0	18
7		17·0	22·0	21·0	20	4				4·0	14
8		16·0	19·0	21·0	17	5				0·0	11
9		10·0	13·0	16·0	12	6				11·0	19
1820	20·0	0·0	3·0		6	7					20
1	25·0	18·0	19·0		19	8					20
2	23·0	14·0	18·0		16	9					18
3	24·0	4·0	8·5	Chiswick Roy. Hort. Soc.	10	1860				—1·0	5
4	25·0	19·0	24·0		21	1				6·0	14
5	26·0	21·0	24·0		22	2				14·0	19
6	16·0	10·0	9·1	11·0	10	3					25
7	16·0	10·0	12·0	12·0	11	4					14
8	25·7	24·0	20·0	21·0	21	5					15
9	18·2	16·0	15·0	15·0	15	6					23
1830	15·8	8·0	10·5	10·0	10	7					5

Camden Town.

Greenwich Royal Obsy.

In conclusion, we submit to the consideration of observers the desirability or otherwise of preparing a fuller table for the frost of January, 1867, and secondly, of preparing a table similar to Table IV.

for other parts of the country. Scores of good registers exist, and we leave it to the observers to send or to withhold the needful data, viz.—(1) the lowest temperature in the air, 4 ft. above the ground, in January, 1867; (2) the lowest temperature in each year as far back as their records extend—not less than ten years. Of course there is no necessary connexion between these two requests—some may *only* have recent observations, others *only* old ones, but either would be useful.

RAIN GAUGE EXPERIMENTS.

To the Editor of the Meteorological Magazine.

December 18*th*, 1866.

SIR,—With reference to the question, now so much discussed in your pages, of the proper material for the funnels of rain gauges, I am disposed to think that the quantity of rain registered depends in a considerable degree upon the surface of the funnel, and whether that surface be or be not of a nature to allow of the speedy flowing off of the water. A *painted* metal funnel is bad, because when the paint is new the rain is apt to stand upon it in drops instead of running down through the pipe, and when old the surface is apt to become cracked and rough, and so retain the water upon it. Of all funnels I should suppose a *copper* one *unpainted*, and kept tolerably free from oxide (not too bright, or the water would in that case also be apt to adhere in drops,) would be best of all; but if porcelain should on trial be found preferable, I suppose that a white enamel (like that upon pans and saucepans) might easily be put upon a *turned iron* funnel, and would be of sufficiently uniform thickness to allow of the area of the funnel being calculated with sufficient accuracy.

As regards another point raised in your pages, I think that the reason why a gauge (properly protected from evaporation) shows a greater rainfall if read monthly than if read daily, is this: that every time the water is poured from out of the receiving-vessel into the graduated glass a certain quantity remains adhering to the sides of the vessel and is *not registered at all;* and that where the reading is taken *daily* this subtraction must occur *whenever any rain has fallen*, but where taken *monthly* can only occur *once in a month*. I have often doubted whether (where daily readings are taken) a greater approach to accuracy might not be obtained by reading from the *apparent* surface of the water in the measuring-glass, rather than from the "*true level*," as advised at p. 25 of your number for April last. I am, Sir, your obedient servant, H. W.

[We have for some years been wishing to try an enamelled funnel, but have alway- been told the heat necessary to the process of enamelling would fatally distort the funnel. We are not opticians, or we might be able to comprehend why a true brass rim could not be rivetted on *after* the heating.—ED.]

DERIVATION OF THE WORD "ANEROID."

To the Editor of the Meteorological Magazine.

Ryde, Isle of Wight, January 1*st*, 1867.

DEAR SIR,—At a philosophical lecture in the Isle of Wight a question was raised as to the derivation of the word "Aneroid," as applied to the barometer of that name. Can you or any of your readers throw any light as to its CORRECT ETYMOLOGY? I am, Sir, your obedient servant,

RICHARD TAYLOR.

[We were not aware that any other derivation had been proposed than *α without*, *νηρος moist*, and *ειδος form*. The "Encyclopædia Britannica," 8th Edition, gives, however, *ἀνέρομαι I inquire*.—ED.]

RAINFALL IN DECEMBER, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground ft.	in.	Above Sea Level. feet.	Depth of Rain. Total Fall. inches.	Difference from average 1860–5 inches.	Greatest Fall in 24 hours. Depth. inches.	Date.	Days on which .01 or more fell.
I.	ENGLAND.	Camden Town	0	6	100	2·63	+1·14	·53	5	16
II.		Staplehurst (Linton Park)	0	6	296	1·47	— ·36	·22	6	15
,,		Selborne (The Wakes)	4	0	500 ?	3·08	+ ·34	·62	5	15
III.		Hitchen	2	0	240	1·89	+ ·58	·38	6	19
,,		Banbury	7	0	345	1·88	+ ·21	·40	5	18
,,		Wisbech	0	6	10	2·05	...	·31	15	17
IV.		Bury St. Edmunds (Culford)	1	2	...	2·58	+1·09	·40	5	16
V.		Calne	0	11	250	2·86	...	·67	5	14
,,		Plymouth (Goodamoor)	0	2	580	6·67	+ ·74	·86	5	20
,,		Barnstaple	0	6	31	5·00	+1·88	·64	5	23
,,		Taunton (Fulland's School)	1	4	...	2·06	— ·46	·50	6	16
VI.		Shrewsbury (Highfield)	5	6	200	1·31	— ·37	·50	7	15
,,		Tenbury (Orleton)	0	9	200	1·74	— ·72	·41	4	21
VII.		Leicester (Wigston)	0	6	220	2·15	+ ·63	·39	30	18
,,		West Retford	0	6	50	...	...	...	...	...
,,		Derby	5	0	180	2·22	+ ·67	·41	6	22
VIII.		Manchester	2	7	106	4·15	+1·82	·58	3	24
IX.		York	0	6	50	1·75	— ·05	·54	6	18
,,		Skipton (Arncliffe)	3	0	750	10·05	+5·50	1·23	3	24
X.		North Shields	1	0	124	2·05	— ·15	·40	6	15
,,		Borrowdale (Seathwaite)	1	0	422	25·39	+8·44	3·66	10	25
XI.	WALES.	Abercarn	1	3	450	6·00	...	1·16	3	17
,,		Haverfordwest	2	0	60	4·68	+ ·15	·78	4	20
,,		Rhayader (Cefnfaes)	2	0	880	5·69	+2·40	1·28	3	25
,,		Llanberis (R. Victoria Hotel)	1	0	370	8·52	...	1·25	3	23
XII.	SCOTLAND.	Dumfries	0	5	70	3·40	— ·06	·48	6	22
,,		Hawick (Silverbut Hall)	4	0	512	3·46	...	·72	6	23
XIV.		Ayr (Auchendrane House)	2	3	94	6·32	+2·30	·69	15	21
XV.		Otter House	0	6	130	...	...	..	...	...
XVI.		Leven (Nookton)	0	6	80	2·94	+ ·16	·42	6	17
,,		Stirling (Deanston)	0	0	130	6·37	+2·17	·59	14	25
,,		Logierait	1	0	250	3·42	...	·75	7	18
XVII.		Ballater	0	10	656	2·87	...	·67	30	19
,,		Aberdeen	4	8	115	3·17	...	·71	28	25
XVIII		Inverness (Culloden)	3	0	104	3·86	...	·81	29	17
,,		Fort William	0	8	20	13·83	...	1·45	17	28
,,		Portree	0	4	60	15·44	— ·19	2·40	17	29
,,		Loch Broom	0	8	48	10·05	...	2·50	28	30
XIX.		Helmsdale	1	0	34	5·81	...	1·02	6	22
,,		Sandwick	2	0	78	4·76	+ ·80	·54	6	25
XX.	IRELAND.	Cork	6	0	65	4·22	...	·63	1	24
,,		Waterford	4	0	60	3·57	— ·85	·63	7	27
,,		Killaloe	5	0	128	6·02	+2·53	·82	3	25
XXI.		Portarlington	1	2	236	2·91	— ·28	·40	4	26
,,		Monkstown	0	6	100	1·71	— ·91	·52	6	21
XXII.		Galway	6	0	25	5·60	...	·68	6	25
,,		Buunnadden (Doo Castle)	1	0	...	4·60	...	·72	2	23
XXIII		Bawnboy (Owendoon)	1	3	218 ?	5·57	...	·76	6	25
,,		Waringstown	0	4	191	3·36	...	·48	3	23
,,		Strabane (Leckpatrick)	0	5	260	4·75	...	·44	2	26

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail.

ENGLAND.

LINTON PARK.—The whole month remarkably mild, the birds singing as if in March, while many tender plants injured by the frost in November became quite fresh towards the end of the month. Fogs prevailed during the beginning and middle of the month; with some few brisk winds but not at any time high, the prevailing direction being W.S. to S.W., there were ten slight frosts. L on 6th and 17th; evenings (when no moon) very dark.

SELBORNE.—Max. 51°·5 on 6th; Min. 21°·0 on 1st. Wind tempestuous during the month; almost entirely from the S.W., W., or N.W., except on 1st, 8th, 20th, and 24th. Not a flake of snow hitherto, this winter. 28th the most gorgeous sunset I ever behel l. Dense fog all day on 22nd.

HITCHEN.—30th December, bar. lower than at any time since March.

BANBURY.—31st, a little snow. Max. 55°·2; min. 27°. Fog on 22nd.

WISBECH.—26th, gale at 7 p.m., 14 lbs. pressure at 10 p.m.; 31st at 11 p.m., snow 1 in deep; wind S.W. on 20 days; slight frosts on 8 nights, but the month generally was mild. Dense fog all day on 22nd.

CULFORD.—Max. 56° on 6th; min. 17° on 31st. Severe and winterly weather appears to be setting in during the last night of the month and year. Fog on 22nd.

CALNE.—T S at 6 a.m. on 13th in W; violent T S at 8 p.m. on 14th, with H and wind; ·23 in. fell in 20 minutes, and another T S at 6 a.m. on 15th. Gale, with H storms on 7th; on 4th very mild, primroses in bloom, crocus above ground on 20th, and snowdrops on 28th.

GOODAMOOR.—T on 14th and 15th. Max. 58°; min. 24°.

TAUNTON.—L in E. on 12th and 15th; T S from S.W. and ranging northward to E. on 16th. Weather generally mild and even warm during the month; beans and strawberries in flower; slight fall of snow on 31st.

ORLETON.—Temp. variable, but on the whole higher than the average; the air generally damp, with frequent slight falls of R; violent winds on the 4th, 15th, 26th, and 27th; a slight fall of snow on the night of 31st; dense fog all day on the 22nd. Max. 58°·2 on 4th; min. 24°·3 on 20th.

WIGSTON.—Both the temp. and rainfall slightly above the average.

YORK.—Bar. 30·616 at 3 p.m. on 20th, and only 28·990 on 30th.

ARNCLIFFE.—Max. 56°; Min. 28°. A very wet month.

SEATHWAITE.—An excessively wet month, with but little frost till the last day of the year; four days on which the R fall exceeded 2 in.

WALES.

ABERCARN.—A wet and stormy month on the whole, but the latter part mild and calm. T S on night of 14th and another on 15th. There was no frost until the last day of the year, roses, wallflowers, &c., being still in bloom.

HAVERFORDWEST.—A stormy, gloomy, wet month. Very mild; primroses and garden cowslips in bloom, and on the 15th a rose carnation bloomed perfectly. Violent gales on the 6th, 13th to 15th, and again from 26th to the end. The last three days cold and gloomy, with snow. Ther. at or below 32° on 7 nights.

CEFNFAES.—High flood in the Wye on the 3rd. T and very vivid L on the 14th. Weather generally wet and damp through the whole month; only five really fine days. Max. 53°; Min. 19°. Snow on the 31st.

SCOTLAND.

DUMFRIES.—Snow on the hills on the 8th, and here on the 31st. The month has been wet and stormy, with a mild temperature. On the night of the 6th and morning of 7th a violent hurricane, and the bar. fell 1·245 in. in 24 hours. At Christmas the field daisy flowering abundantly, and the furze in blossom. The close of the month wintry, with snow and frost.

SILVERBUT HALL, HAWICK.—A hurricane from the W. on the 6th, and gales from the same quarter on 17th, 18th, 26th, 27th, and 28th. Gardening and husbandry operations in an advanced state, there having been no interruption from frost till the last two days of the month; but it is now pretty keen, and about 3 in. of snow on the level.

AUCHENDRANE.—Month mild, wet and boisterous throughout.

DEANSTON.—No snow during the month, except on the hills. Max. 55°·8; Min. 21°.

LOGIERAIT.—Little frost till the 31st. Roses in bloom at that time. No snow.

BALLATER.—Aurora at 7 p.m. on 25th. The weather throughout (with slight exceptions) very mild. Max. 56°·3 on 18th, higher than for 2 months previously. Bats seen flying about from 22nd to 24th. Auriculas, primroses, &c., in flower. During the last week the weather became wintry, a snow storm commencing on the morning of the 30th, and the year closed with an average depth of 4 inches.

ABERDEEN.—A dull month, with very unsteady Bar., and less than the usual range of temperature. Frosts on 11 nights at 4 ft. from the ground, and on 24 on grass. Max. 53°·5 on 18th; Min. 24°·1 on 31st. Lunar rainbow on 21st.

ROSSE PARSONAGE.—Gale from N.E. through the night of the 6th; gale from S.W. on 18th; sprinkle of snow on 31st. A wet and boisterous month; only three days on which no R was registered. The total fall, 13·83 in., is greater than any month since observations were commenced here (two years ago), except January last, when 14·19 in. fell.

PORTREE.—This month has been very wet, stormy, and changeable throughout. A very bad month for sheep and cattle. Snow on the hills in the middle of the month, but none here till the close.

LOCHBROOM.—The month commenced beautifully, as if borrowing its character from the end of November, but on the 3rd a sweeping gale from the N. threatened great destruction; it was terrific during the whole day. With varying temperature, the month was rainy till the 28th, when we had a fall of 2·50, being more than double the greatest fall registered during the past two years. On the whole it has been a grand grazing month, but at the close intense cold and heavy snow came on suddenly.

SANDWICK.—Very bright Aurora from 7 to 8 p.m. on 25th. Hills white with snow on 7th and 8th, again on 27th. Gale 50 m. per hour from midnight to 5 a.m. on 28th. Ground white with snow on the 30th, and 4 inches deep at the close of the year.

IRELAND.

MONKSTOWN.—Although the total quantity of R was not great, the month was generally wet; the last day's measurement, ·15, consisted principally of snowy sleet, which fell in constant showers, ushering in the new year with quite a wintry appearance. Bar. on 6th, 29·124. One of the most fearful gales that has occurred for a long time was on the 6th and 7th; it commenced about 7 p.m. on 6th, and blew with terrific violence from S. until 11 p.m.; it then lulled, but only to recommence about 2 a.m. on 7th from W.S.W. with almost double fury. The sea outside was terrific, and the mail steamer was two or three hours late owing to the force of the gale.

GALWAY.—Terrific storm commenced about 8 p.m. on 6th, and lasted through the night. Min. 25° on 31st, with snow.

DOO CASTLE.—Wet open month, and as a rule free from frost. Violent storm on night of 6th; several trees snapped asunder, and stacks of corn blown down.

OWENDOON.—Very wet month, high floods; first snow on 31st.

WARINGSTOWN.—A wet and stormy month; the soil thoroughly saturated with moisture, but the temperature somewhat above the average until the last two days, which were cold and wintry. Heavy gales on the 6th and 28th. Snow on the 31st only. Frost on grass on 17 nights.

LECKPATRICK.—6th, gale.; Bar. 28·72 at 11 p.m., rose to 30·22 at 9 a.m. on 7th. Frost on grass 14 nights. Gale from S.W. 17th and 26th. Weather of month mild though stormy. Vegetation very far forward; fruit tree buds unfolding, hepatica in flower, peony rose coming into leaf.

NEWPORT, MONMOUTH.—With reference to the statement, page 52, No. VI., that "*square pieces of ice of upwards of a pound weight each were found in the neighbourhood of the Docks,*" I was informed, after the statement appeared in the local press, that it was a hoax. I was in the thick of the storm, and saw no hailstones apparently more than one inch in diameter. Great damage resulted from the deluge of rain. At a distance of four miles westward of Newport scarcely a drop fell.—W. FLINT.

NOVEMBER METEOR SHOWER.

Observations of the Meteoric Shower, on the night of November the 13th, 1866.

Taken at the Military Hospital Observatory, at Aberdeen.

Estimated numbers, and direction of flights of Stars counted at Aberdeen, by Thomas Turner, in 4 hours, on the night of the 13th November, 1866.	N. to S.	N. to W.	N. to E.	N.E. to S.W.	N.W. to S.E.	S. to W.	S. to N.	S. to E.	E. to W.	E. to S.	W. to E.	N.E. to S.	E. to N.	Total No of Stars counted per hour	Weather during night.	Direction of Wind.	Appearance during night.
From 10.30 p.m. to 11.30 p.m.	94	3	44	10			343	4	4	3	6	21		235	Clear but cloudy to S.E.	N.N.E.	The first star was seen fall at 10.30 p.m.
From 11.30 p.m. to 12.30 a.m.	123	53	41	56	53	131			25	6		29	3	421	Ditto.	Ditto.	Stars very brilliant from the N.
From 12.30 a.m. to 1.30 a.m.	389	281	143	86	6		3	8	34	1		6		704	Ditto.	N.W.	Stars brilliant, & an abundance from all quarters like rockets, but generally like fire balls.
From 1.30 a.m. to 2.30 a.m.	280	29	26	73	13	22			43			53		539	Over cast at 2.30 a.m.	W.	From 12.30 a.m. to 2 a.m. sky covered all over with stars darting in all directions.
Total No. counted	886	113	254	225	72	26	77	12	106	10	6	109	3	1889			

THOMAS TURNER, Sergeant A. H. Corps,
Hospital Sergeant 15th D Battalion, Aberdeen.

To the Editor of the Meteorological Magazine.

Rockville, Black Rock, near Dublin, December 18th, 1866.

SIR,—About 1 a.m. Nov. 14th (Dublin time) a brilliant meteor passed from the head of Leo about 10 degrees N.W. of the zenith, disappearing about 40 degrees from the western horizon. It left a brilliant tail behind, some 20 degrees long; this, after remaining stationary some 2 or 2½ minutes, gradually began to shorten and concentrate; then to curve, and in 2 or 2½ minutes more became circular by the two ends meeting together, in fact a perfect ring some 6 or 8 degrees in diameter, the centre being clear sky. The concentration still slowly continued, until in about 2½ or 3 minutes more the clear centre became obliterated, and the whole assumed the appearance of a brilliant, luminous, white globe about 4 or 5 degrees in diameter. In this state it remained some time, 2 or 3 minutes, and

then gradually faded away. I cannot speak accurately as to time, but I think the whole may have occupied some 10 or 12 minutes. The thing was most wonderful—indeed astounding. I am, yours very truly,

THOS. BEWLEY.

P.S. Several persons in Dublin saw the same appearance I have described above.

An Essay on Dew and several Appearances connected with it. By WILLIAM CHARLES WELLS, [M.D., F.R.S.L. & E.] Edited, with Annotations, by L. P. CASELLA, F.R.A.S.; and an Appendix by R. STRACHAN, F.M.S. London: Longmans, cloth 8vo. 163 pages.

MR. CASELLA deserves the thanks of meteorologists for placing within their reach copies of Dr. Wells' scarce, celebrated, and interesting Essay on Dew, with an epitomized biography, a few foot-notes, pointing out the bearings of recent discoveries on Dr. Wells' researches; also an appendix by Mr. Strachan, which consists mainly of quotations from Tyndall's recent works on Heat and Radiation, Glaisher's paper on radiation ("Phil. Trans. 1847"), and other articles bearing on the subject. The notes and appendix have one main fault—there is not enough of either. To take an instance in the appendix: when speaking of summer frosts, no reference is made to the considerable ones experienced in July, 1863, and the beginning of August, 1864, when white frost was general throughout Great Britain, and even ice was formed in several places. This remarkable phenomenon having a special bearing on the influence of vapour on terrestrial radiation, which it is one of the main objects of the appendix to illustrate, for those frosts were unquestionably due to the excessive droughts which preceded their occurrence having rendered the atmosphere unusually dry, and therefore favorable to radiation. We differ from Mr. Casella, who says in the preface—"at the present day the Essay on Dew is the only one [of Dr. Wells' works] which can lay claim to the attention of the general reader;" and think a reprint or abstract of the elaborate review in the "Quarterly" by Dr. Young, and of Dr. Wells' reply published in the "Annals of Philosophy" in April, 1815, would have added to the completeness of the work. These, however, are small matters, pointed out mainly as suggestions, should the present generation require as many editions as when the essay was first brought out in 1814, followed by fresh editions in 1815, 1818, and 1821.

END OF VOL. I.

G. SHIELD, PRINTER 80, LOWER SLOANE STREET, S.W.